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The Pan-Pacific Entomologist

Vol. XXXI July, 1955 No. 3

THE GENUS *CHAETOPSYLLA* KOHAUT, 1903 IN NORTH AMERICA, WITH THE DESCRIPTION OF A NEW SPECIES.

(Siphonaptera: Vermipsyllidae)

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The genus *Chaetopsylla* Kohaut, 1903 is holarctic in distribution, with two previously described North American representatives, *Chaetopsylla lotoris* (Stewart, 1926) from the eastern and central United States, and *Chaetopsylla floridensis* (I. Fox, 1939) known only from the type specimens collected in Gainesville, Florida. A new western species is described below, considerably broadening the known range of this genus in North America.

Diagnoses, redescriptions (emphasizing characters differing from the new species) and figures of *C. floridensis* and *C lotoris* are included.

Chaetopsylla stewarti Johnson, new species
(Figs. 1–4, 7, 11, 17, 23)

Male separable from *Chaetopsylla lotoris* (Stewart) in that the metepimere (fig. 3, *MTM)* possesses a median (first) row of four bristles, not one or two (fig. 15); distinguished from both *C. lotoris* and *C. floridensis* (I. Fox) in that the penis rods form a complete circle (fig. 4, *P.R.)* not merely curved (fig. 5, *P.R.);* sclerotized inner tube (fig. 7, *S.I.T.)* apically bent ventrad, not straight (fig. 6, *S.I.T. (floridensis)* or apically inclined dorsad (fig. 8, *S.I.T. (lotoris)*. Female separable from *lotoris* in that posterior margin of seventh sternum lacks a sinus (fig. 23, *7S.);* not with deep rounded concavity (figs. 21 and 24). Female differing from *C. floridensis* in lacking bristles below spiracles of abdominal terga four to seven.

Head (fig. 1): A vertical row of three or four small bristles anterior to ocular row which consists of four long bristles. Lacking bristle on genal process just below eye which is present in certain other species of genus. The two postantennal rows (excluding complete apical row of bristles) of three and four (five in female) bristles respectively. Five-segmented labial palpi extending about two-thirds length of procoxa; in male length of ultimate segment about that of third and fourth segments combined; in female ulti-

mate segment somewhat longer than third and fourth combined. *Thorax* (fig. 3): Pronotum (fig. 1, *PRN.*) with one row of bristles; male dorsally with one or two large, and several smaller bristles anterior to row; female with but one large bristle in this area. Prosternosome with ventral margin quite sharply rounded medially; proepimeral flange (fig. 1, *E.F.*) distinct, small, triangular. Metepimere *(MTM)* with anterior row of bristles missing; median row of four bristles (four to six in female); posterior row with four or five (five or six in female). Metasternal furca *(FU.-II)* with short, acute posterior arm. *Legs:* Procoxa (fig. 1) with fifteen or more obviously lateral bristles (in figure, procoxa is turned so that the "mesal" surface is actually the normal lateral surface). All tibiae with six dorsal notches, each with two bristles; laterally metatibia with subdorsal row of 11 bristles in male, 14 in female, plus a few apicoventral bristles. Metafemur with external horizontal row of 18–19 irregularly spaced bristles. *Abdomen:* Male with anterior of the two tergal rows of bristles reduced on terga four to seven, broadly interrupted laterally, dorsally this row with one or two bristles and with one or two bristles directly above spiracle, at times one below spiracle (one of bristles of posterior row may also be below spiracle). Female lacking bristles below spiracles of terga four to seven; anterior rows of but one or two bristles placed directly above spiracle, posterior rows ending well above level of spiracle on terga four to seven. Female intersegmental membranes not as obvious as in *C. floridensis* and lateral tergal margin more nearly vertical (compare figs. 23 *(stewarti)* and 22 *(floridensis)*.

Modified segments, male (fig. 2): Eighth tergum *(8T.)* with two scattered rows of small bristles above and anterior to spiracle, consisting in unique male of nine or ten bristles in all; below and posterior to spiracle with three bristles, the dorsal one small, others rather large. Eighth sternum *(8S.)* with three ventral bristles on a side. Immovable process of clasper (*P.* and fig. 17) somewhat higher than broad; with approximately 10 bristles (other than marginals) scattered over lateral surface from apex to lowest level of insertion of movable finger; below insertion of finger with mesal patch of several light thin bristles. Movable finger (*F.* and fig. 17) almost straight, inserted medially on process, gradually tapering to sharply rounded apex which does not extend beyond margin of process (in normal position); finger five times as long as broad basally; with a few minute bristles on posterior margin. Proximal arm of ninth sternum *(P.A.9)* narrowed apically, joined to manubrium of process; distal arm *(D.A.9)* very short, subtriangular, with a few small apical and subapical bristles. Aedeagal apodeme (fig. 4, *AE.A.)* long and narrow, more than five times as long as broad; apex acute. Crescent sclerite ((fig. 7, *C.S.*) straight and longer than dorsal sclerite of apodemal strut *(D.S.)*. Sclerotized inner tube *(S.I.T.)* about five times as long as broad, apically bent ventrad, gradually narrowing from base to apex, armature *(A.I.T.)* diffuse. Median dorsal lobe *(M.D.L.)* with dorsal margin merged with dorsal margin of distolateral lobes, apicoventrally merely a diffuse spiculated semimembranous structure. Distolateral lobes *(DL.L.)* with apicodorsal angle of about 90°; posteroapical margin unevenly convex; ventroapically sharply rounded. Lateral lobes *(L.L.)* angulate but with angles rounded; extending ventrally almost to lower level of crochets and

pouch wall *(P.W.)*. Crochets *(CR.)* arising ventrad to inner tube and about at midportion of tube, not extending to apex of tube, same width throughout; apically rounded (actually, apparently flexed dorsally so that the apex points cephalad); entire margin much more heavily sclerotized than remainder of crochet. Pouch wall *(P.W.)* insensibly joined with base of crochets. Penis rods (fig. 4, *P.R.*) long and forming a complete circle.[1]

Modified segments, female (fig. 23): Posterior margin of seventh sternum *(7S.)* lacking sinus, though ventrolaterally the margin is somewhat concave. Eighth tergum *(8T.)* with group of about seven bristles above spiracle; row of large bristles extending from just below spiracle to venter of segment, interrupted lateromedially. Spermatheca (*SP.* and fig. 11) with oval body, tail almost two times as long as body and about half as broad; curved back over body. Bursa copulatrix *(B.C.)* short, sinuate, very lightly sclerotized.

Holotype male, *allotype* female *ex* weasel, SARDINE CAÑON, CACHE COUNTY, UTAH, 28 December 1937, Deming collector. Types deposited in the collections of the United States National Museum.

This species is named for Dr. M. A. Stewart of the University of California, Berkeley, who described the first American representative of the genus.

CHAETOPSYLLA LOTORIS (Stewart)

(Figs. 5, 8, 12–15, 18, 21, 24)

Trichopsylla lotoris Stewart, 1926. Insecutor Inscitiae Menstruus XIV(7–9): 122, one fig.

Chaetopsylla lotoris, Wagner, 1936, Canad. Entom. 68:195.

Trichopsylla lotoris, I. Fox, 1940, Fleas Eastern U. S.: 33, pl. VIII, figs. 35–37; pl. IX, fig. 42.

Chaetopsylla lotoris, Jellison and Good, 1942, Nat. Inst. Health Bull. No. 178:41. Ewing and I. Fox, 1943, Fleas North Amer.:18, fig. 4e. Fuller, 1943, Bull. Brooklyn Ent. Soc. 38:19.

Generally with fewer bristles than the other two North American species. Female separable from *C. stewarti* sp. nov. and *C. floridensis* (I. Fox, 1939) in possessing a large rounded ventral sinus in posterior margin of seventh sternum (figs. 21 and 24); not lacking such a sinus (figs. 23 and 22, *7S.)*; further distinct from *C. floridensis* in lacking bristles below the spiracles on terga five to seven (compare figs. 18 *(lotoris)* and 20 *(floridensis)*. Male differing from *stewarti* sp. nov. in that the penis rods do not form a complete circle (figs. 5 *(lotoris)* and 4 *(stewarti)*, *P.R.)*,

[1] The homologies of the median dorsal lobe, distolateral lobes and the crochets are more clearly seen in **Chaetopsylla homoeus** ssp. (from Asia and Europe). In this species the median dorsal lobe (fig. 9, **M.D.L.**) is mesal and more obviously a structure separate from the distolateral lobes (**DL.L.**). The crochets (**CR.**), rather than being flexed upon themselves, are directed caudad in the more typical manner.

the sclerotized inner tube (fig. 8, *S.I.T.)* apically upturned, not bent ventrad (fig. 7, *S.I.T.);* and from *floridensis* in that the median row on the metepimere contains only one or two bristles (fig. 15), not four to six (fig. 16); male and female separable from *floridensis* in that the procoxa lacks lateral bristles, not with 30 or more such bristles.

Head: Preocular row of four short bristles in male, three or four in female; ocular row of four longer, stout bristles. Labial palpi extending about two-thirds length of procoxa in both male and female, apical segment obviously longer than segments two to four combined in male, ultimate segment only somewhat longer than segments three and four combined in female. Postantennal area with first of the two rows containing three or four (usually three) bristles in both sexes; second row of three bristles in all specimens examined. *Thorax:* Metepimere (fig. 15) usually with two rows of bristles; an occasional specimen with a single bristle anterior to the rows; ranges as follows: anterior: O-I; median: 1–4; posterior: 5–8. The holotype female has 1(0); 2;8(7) bristles on metepimere; cotype male with 0;1;6 bristles. *Legs:* procoxa with all bristles marginal or submarginal. *Abdomen:* Terga 5–7 (usually 4–7) of female lacking bristles below spiracles (fig. 18); anterior of the two rows reduced, consisting of 1–3 bristles on a side placed just above the spiracle. In female, posterior margin of terga not markedly oblique, and intersegmental membranes mostly covered by the terga.

Modified segments, male: Eighth tergum with single row of seven bristles above spiracle. Immovable process of clasper (fig. 14 *P.*) obviously higher than broad, apex sharply rounded in some specimens (including cotype); lateral bristles sparse and confined to area above insertion of movable finger. Movable finger (fig. 14, *F.*) curved, tapering to sharply rounded apex, about four times as long as broad; inserted above middle of immovable process. Aedeagal apodeme (fig. 5, *AE.A.)* three times as long as broad, apically rounded. Crescent sclerite (fig. 8, *C.S.*) straight, somewhat longer than dorsal sclerite of apodemal strut *(D.S.).* Sclerotized inner tube *(S.I.T.)* about six and one-half times as long as broad, straight, gradually narrowing apically and with apex upturned; its armature *(A.I.T.)* vaguely indicated as a large diffuse lateral sclerite overlying most of apical half of tube. Median dorsal lobe *(M.D.L.)* extending well above and beyond distolateral lobes *(DL.L.);* with convex, well-sclerotized dorsal margin; ventral margin pale, rounded apically. Distolateral lobes with heavily sclerotized convex posterior margin, acute ventrally; anterior margin straight, apex of endchamber thus with triangular notch at juncture of *DL.L.* and *M.D.L.* Lateral lobes *(L.L.)* small, ending ventrally at level of dorsal margin of crochets. Crochets *(CR.)* about as broad as long; marginally sclerotized, apically rounded (as in *C. stewarti* sp. nov. they are apparently directed cephalad). Penis rods (fig. 5, *P.R.*) extending past apex of apodeme but uncoiled.

Modified segments, female: Seventh sternum (figs. 21 and 24) with posterior margin deeply excised ventrolaterally. Spermatheca (fig. 12) indistinguishable from *stewarti* sp. nov. In holotype, spermatheca is distorted

and foreshortened (fig. 13). Bursa copulatrix well sclerotized, somewhat curved, not sinuate.

Holotype female, *cotype* male *ex* raccoon, *Procyon lotor*, Olcott, New York, 16 November 1921, deposited in Cornell Museum.

Specimens examined.—Holotype female, cotype male. Three males and three females with same data as holotype. Fifteen females *ex* raccoon, Snicarte, Illinois, December 1933, Hunt and Lane collectors. One female *ex Procyon lotor*, Minnesota, 2 December 1895, Otto Lugger collector. One female *ex* "den of red fox", Urbana, Illinois, December 1939, R. Traub collector. One female *ex Procyon lotor*, Dryden, Maine, 29 March 1952, G. Heinrich collector.

Remarks.—Fox (1940) records this flea from Clayton County, Iowa; Lucerne-in-Maine, Maine; and Pisgah National Forest, North Carolina. All records were from raccoons. Fuller (1943) gives additional records of Findleyville, Pennsylvania *ex Procyon lotor*, and East Greenville, New York *ex* gray fox. Fuller remarks that *Procyon* appears to be the normal host, but that the collections are too sparse to present an adequate sample.

Chaetopsylla floridensis (I. Fox)

(Figs 6, 10, 16, 19, 20, 22)

Trichopsylla floridensis I. Fox, 1939, Proc. Ent. Soc. Wash. 41(2):45, fig. 6, I. Fox, 1940, Fleas Eastern U. S.:32, pl. VIII, figs. 34, 36, 39.

Chaetopsylla floridensis, Ewing and I. Fox, 1943, Fleas North Amer.:17.

Generally with more bristles than the other two North American species. Female separable from *Chaetopsylla stewarti* sp. nov. and *C. lotoris* (Stewart, 1926) by having at least two bristles below spiracles on terga 5-7 (fig. 20), not completely lacking bristles in this area (fig. 18); and with partially double row of bristles on eighth tergum (Fig. 22, *8T.)* not with but one row (fig. 23, *8T)*. Male differing from *C. lotoris* in that median row on metepimere contains 4–6 bristles (fig. 16), not 1–2 (fig. 15); and by the configuration of the distolateral lobes of the aedeagus (compare figs. 6 *(floridensis)* and 8 *(lotoris)*, *DL.L.)*; separable from *C. stewarti* sp. nov. in that the penis rods do not form a complete circle and the movable finger (fig. 19, *F.)* obviously set nearer posterior margin of immovable process of clasper *(P.)*, not median in position on process (fig. 17, *F.* and *P.)*.

Head: Preocular row of 4–6 short bristles; ocular row of four long, stout bristles. Labial palpi extending approximately to apex of procoxa in female; the apical segment almost as long as segments 2–4 combined; in

LIST OF ABBREVIATIONS USED IN FIGURES

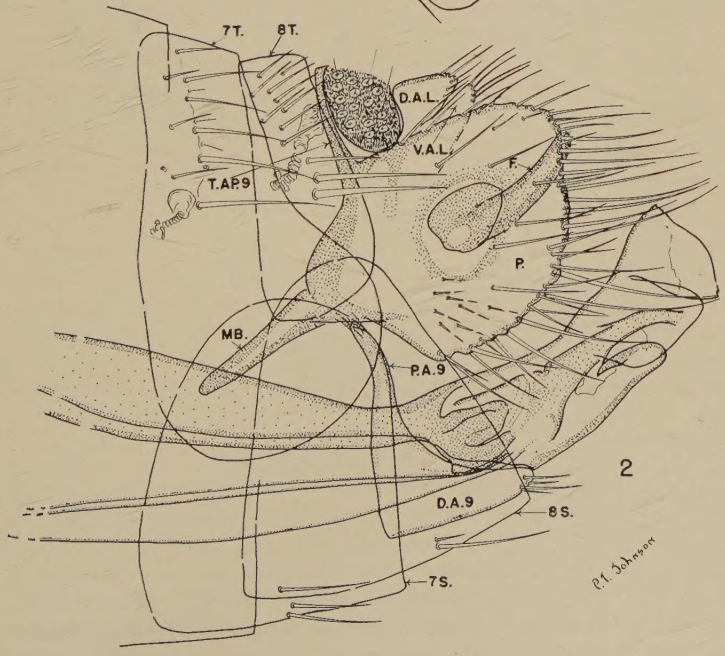
AE.A ..... aedeagal apodeme
A.I.T. ..... armature of sclerotized inner tube, aedeagus
A.T.A. ..... anterior tentorial arm
B.C. ..... bursa copulatrix
C.-II ..... mesocoxa
C.-III ..... metacoxa
CR. ..... crochet
C.S. ..... crescent sclerite, aedeagus
D.A. 9 ..... distal arm of ninth sternum
D.A.L. ..... dorsal anal lobe
DL.L. ..... distolateral lobe, aedeagus
D.O. ..... ductus obturatus
D.S. ..... dorsal sclerite of apodemal strut, aedeagus
E.F. ..... proepimeral flange
EP.R.-I ..... episternal-epimeral rod, mesothorax
EP.R.-II ..... episternal-epimeral rod, metathorax
F. ..... movable finger of clasper
FU.-I ..... mesosternal furca
FU.-II ..... metasternal furca
KN. ..... knob on tergum one (vinculum?)
L.L. ..... lateral lobe, aedeagus
L.M. ..... lateral metanotal area
L.S. ..... lateral sclerite of apodemal strut, aedeagus
MB. ..... manubrium of clasper
M.D.L. ..... median dorsal lobe, aedeagus
MPM. ..... mesepimere
MPS. ..... mesepisternum
MS. ..... median sclerite of apodemal strut, aedeagus
MSN. ..... mesonotum
MTM. ..... metepimere
MTN. ..... metanotum
MTS. ..... metepisternum
P. ..... immovable process of clasper
P.A. 9 ..... proximal arm of ninth sternum
PL.A. ..... pleural arch
P.R. ..... penis rods, aedeagus
PRN. ..... pronotum
P.W. ..... pouch wall, aedeagus
S.I.T. ..... sclerotized inner tube, aedeagus
SP. ..... spermatheca
SP.D. ..... spermathecal duct
T.AP. 9 ..... tergal apodeme of segment nine
V.A.L. ..... ventral anal lobe
1T. ..... first abdominal tergum
7S. ..... seventh abdominal sternum
7T. ..... seventh abdominal tergum
8S. ..... eighth abdominal sternum
8T. ..... eighth abdominal tergum
9T. ..... ninth abdominal tergum

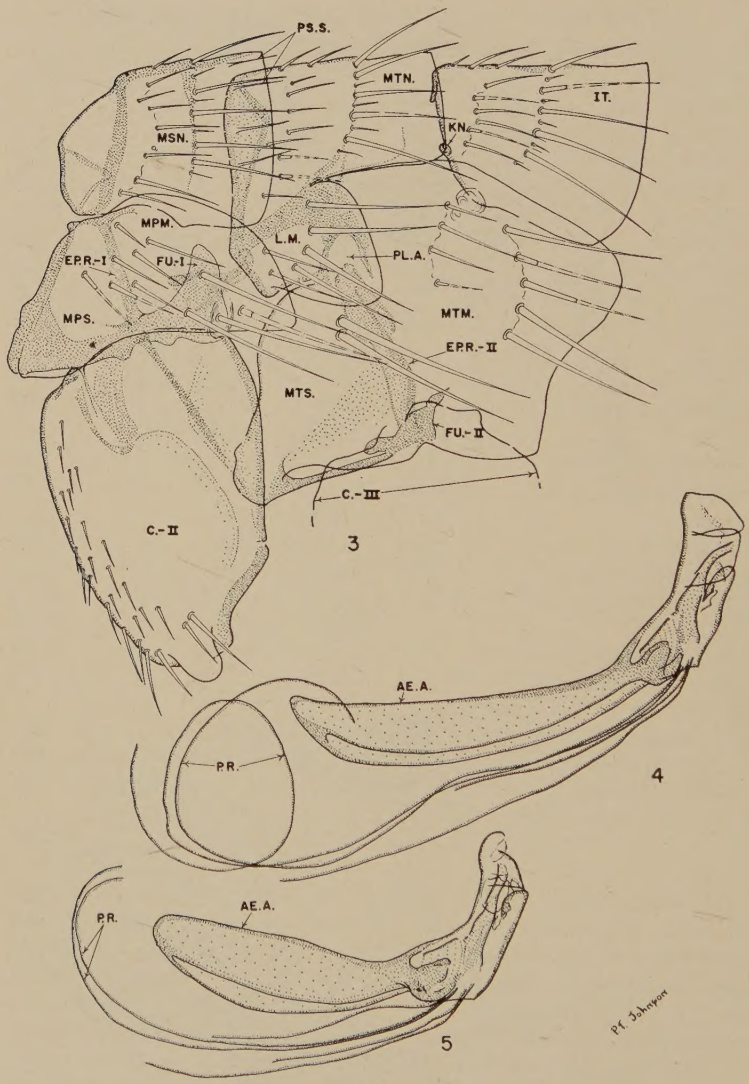
male, labial palpi about two-thirds length of procoxa, apical segment about equal in length to segments three and four combined. In both sexes the anterior two postantennal rows consist of 2–4 and 4–5 bristles respectively. *Thorax:* Metepimere (fig. 16) with two or three rows of bristles (if three rows, the first is scattered and merged with the median or second row); the posterior row consisting of 5–6 bristles; the median row of 4–7 bristles except when anterior row is present, in which case there are 8 bristles in the two rows together (in the two cotype females examined). *Legs:* Procoxa with 30 or more lateral bristles, excluding marginal bristles. Metatibia with 11–19 irregularly placed bristles on dorsal half of lateral surface. Metafemur with external horizontal row of 14–15 bristles in female; 11–14 in male. *Abdomen:* Female with tergal and sternal sclerites distinctly separated laterally by

EXPLANATION OF FIGURES

Fig. 1. *Chaetopsylla stewarti* Johnson: head and prothorax, holotype.
Fig. 2. Ibid: modified abdominal segments, holotype.

PRN.
A.T.A.
E.F.
1


7T.
8T.
D.A.L.
V.A.L.
T.AP.9
F.
P.
MB.
P.A.9
2
D.A.9
8S.
7S.
P.I. Johnson



EXPLANATION OF FIGURES

Fig. 3. *Chaetopsylla stewarti* Johnson: meso- and metathorax, holotype. Fig. 4. Ibid: aedeagus, holotype. Fig. 5. *Chaetopsylla lotoris* (Stewart): aedeagus, cotype.

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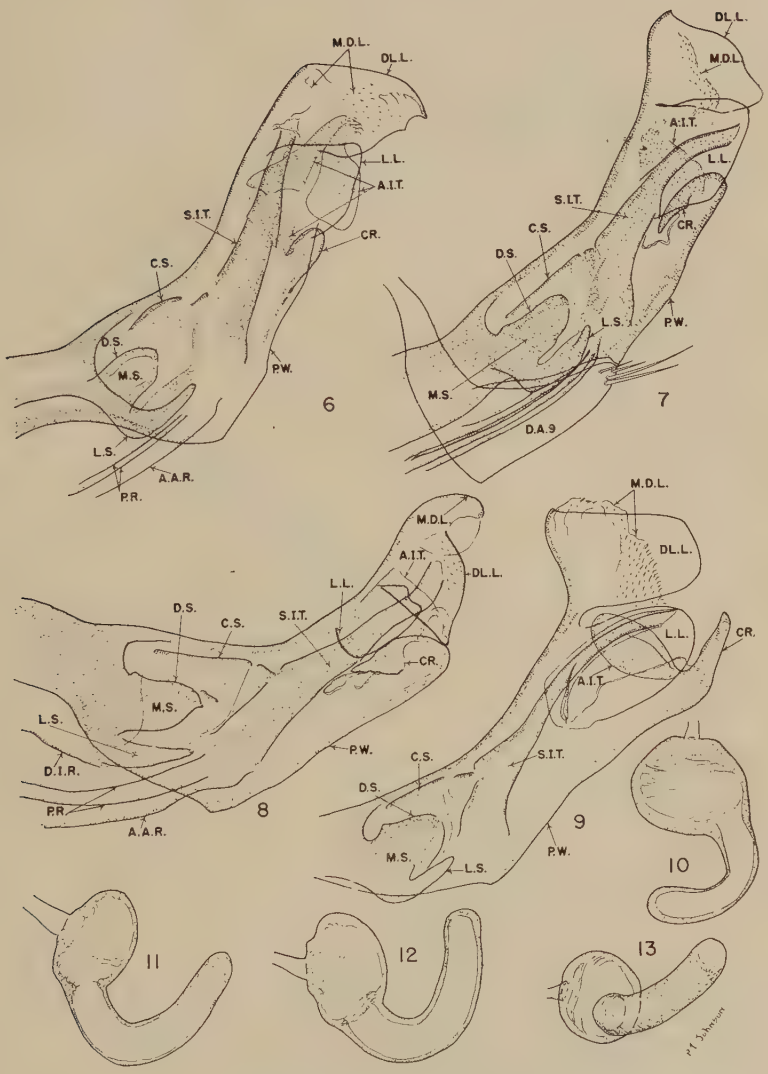
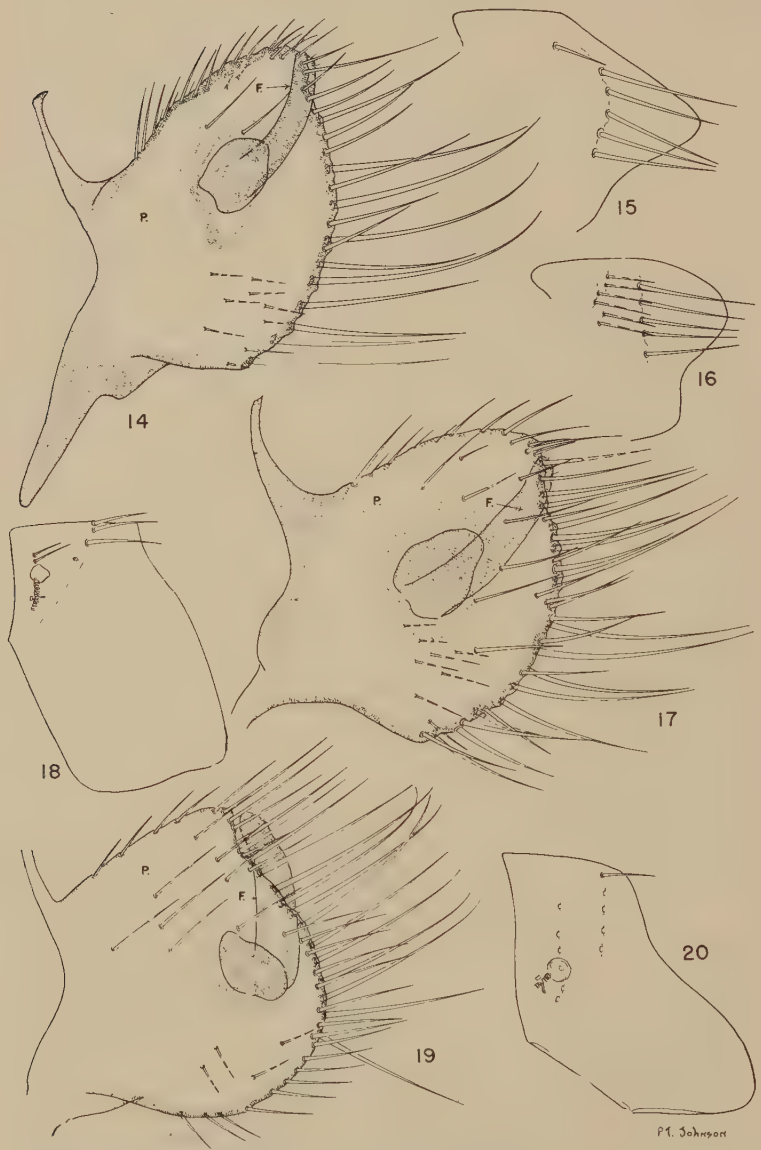
spiculated intersegmental membranes, the terga strongly produced ventrocaudally (fig. 20). Terga 2–7 in female with at least two bristles of anterior row below spiracle (fig. 20); anterior row on terga 1–3 complete dorsally.



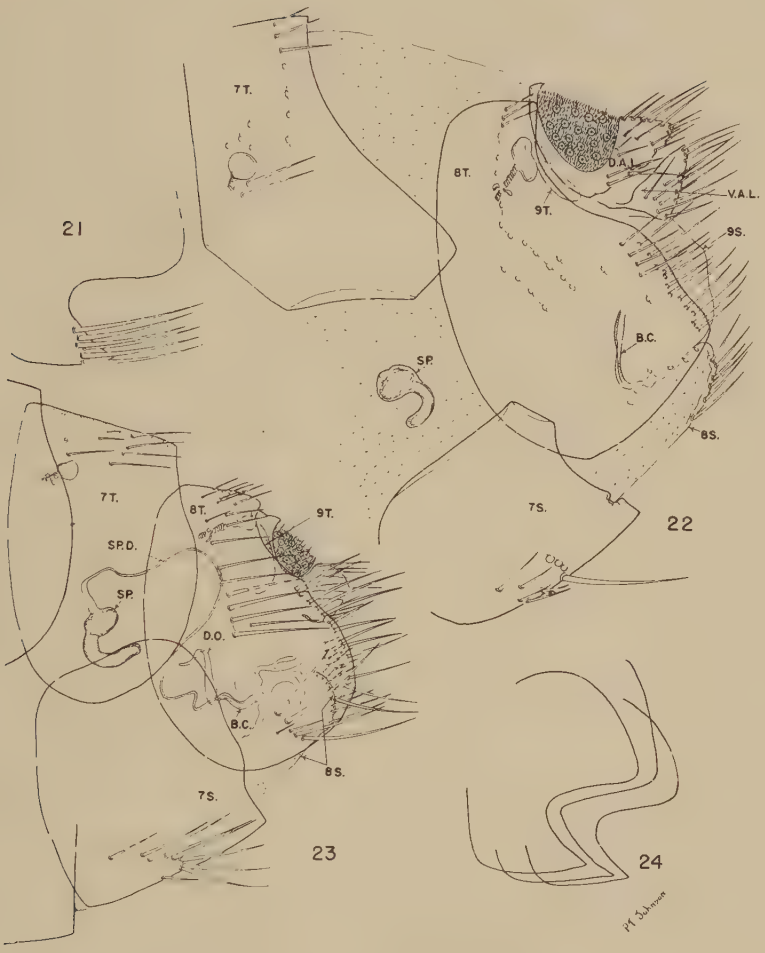
EXPLANATION OF FIGURES

Fig. 6. *Chaetopsylla floridensis* (I. Fox): apex of aedeagus, cotype. Fig. 7. *C. stewarti* Johnson: apex of aedeagus, holotype. Fig. 8. *C. lotoris* (Stewart): apex of aedeagus, cotype. Fig. 9. *C. homoeus* ssp.: apex of aedeagus. Fig. 10. *C. floridensis:* spermatheca, cotype. Fig. 11. *C. stewarti* Johnson: spermatheca, allotype. Fig. 12. *C. lotoris:* spermatheca. Fig. 13. Ibid: spermatheca, holotype.



EXPLANATION OF FIGURES

Fig. 14. *Chaetopsylla lotoris* (Stewart): clasper, cotype. Fig. 15. Ibid: posterior portion of metepimere, cotype. Fig. 16. *C. floridensis* (I. Fox): posterior portion of metepimere, cotype male. Fig. 17. *C. stewarti* Johnson: clasper, holotype. Fig. 18. *C. lotoris:* sixth abdominal tergum, holotype. Fig. 19. *C. floridensis:* clasper, cotype. Fig. 20. Ibid: sixth abdominal tergum, cotype female.



EXPLANATION OF FIGURES

Fig. 21. *Chaetopsylla lotoris* (Stewart): posterior margin of seventh sternum, holotype. Fig. 22. *C. floridensis* (I. Fox): modified abdominal segments, cotype female. Fig. 23. *C. stewarti* Johnson: modified abdominal segments, allotype. Fig. 24. *C. lotoris:* posterior margin of seventh sternum, variations.

Modified segments, male: Immovable process of clasper (fig. 19, *P.*) almost as broad as high; movable finger *(F.)* inserted on process about halfway between most dorsal and most ventral points, and much nearer posterior than anterior margin, measured from insertion on *P.*, finger about three times as long as broad, not strongly curved. Eighth and ninth sterna non-diagnostic. Aedeagal apodeme three times as long as broad anteriorally, apex blunt (as

in *C. lotoris*). Crescent sclerite (fig. 6, *C.S.*) gently convex, about as long as dorsal margin of dorsal sclerite of apodemal strut *(D.S.)*. Sclerotized inner tube *(S.I.T.)* about five and one-half times as long as broad; straight, gradually narrowing to apex, its armature *(A.I.T.)* consisting of one ovate diffuse sclerite lying over middle of tube, and two large dark sclerites apically. Distolateral lobes *(DL.L.)* joined insensibly with median dorsal lobe *(M.D.L.)*; apicoventrally these lobes acute, somewhat hooked; dorsally almost angled at juncture with *M.D.L.* Median dorsal lobe extending ventrally between distolateral lobes as heavily spiculated, diffuse structure. Lateral lobes *(L.L.)* almost rectangular. Crochets of same general structure as in *C. lotoris* and *C. stewarti* sp. nov. Penis rods extending well beyond apex of apodeme but not coiled.

Modified segments, female (fig. 22): Posterior margin of seventh sternum *(7S.)* concave, though not deeply excised; its exact contour impossible to ascertain since in both specimens it has been somewhat broken or otherwise disturbed. Eighth tergum *(8T.)* with lateral bristles in a double row from level of spiracle to level of lower margin of ventral anal lobe *(V.A.L.)*. Eighth sternum *(8S.)* almost entirely semimembranous and spiculated, save for ventral margin where several large bristles are inserted. Spermatheca (*SP.* and fig. 10) with width of tail much less than half that of body, and only one and one-half times as long as body. Bursa copulatrix *(B.C.)* well sclerotized, slightly sinuate.

Cotypes: two males, two females *ex* "garden truck leaf mold", Gainesville, Florida, 30 September 1935. Deposited in United States National Museum.

Specimens examined.—Two male and two female cotypes.

Acknowledgments

I am grateful to Dr. Henry Dietrich, Curator of Insects of Cornell University, for lending me the type specimens of *Chaetopsylla lotoris* (Stewart, 1926) and to Mr. C. W. Muesebeck, U. S. Dept. of Agriculture, for lending cotype specimens of *Chaetopsylla floridensis* (I. Fox, 1939). Dr. M. A. Stewart and Lt. Col. Robert Traub kindly allowed me access to their specimens of *C. lotoris*. Dr. J. S. Stanford, Utah State College of Agriculture, was instrumental in obtaining for study the specimens of *Chaetopsylla stewarti*.

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A NEW GENUS FOR TWO NEW SPECIES OF DUFOUREINE BEES FROM CALIFORNIA

(Hymenoptera: Apoidea)

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The discovery and recognition of a new genus of dufoureine bees in California is an unexpected event and noteworthy because the group may represent the more primitive ancestral stock from which *Dufourea* was derived, and because it is excessively rare. The first specimen of the new group was collected in 1914, and additional specimens, representing another species, were not collected until 1955.

Protodufourea Timberlake, new genus

Protodufourea resembles *Dufourea* in general habitus, but is separated at once by the more primitive venation, the forewings having three submarginal cells. Besides the venation, it differs from *Dufourea (s. str.)* in having a differentiated pubescent area on ventral segments 2 to 4, the sixth ventrite emarginate at apex, and the eighth ventral plate slightly expanded at apex. It agrees with *Dufourea* in having the clypeus somewhat longer than the labrum, the antennae inserted only slightly below middle of face, the head and thorax closely and strongly punctured and the tergum of abdomen also closely punctured, but with a broad, smooth apical depression on each segment. From *Conanthalictus* it differs in the larger clypeus, with the antennae inserted higher on the face; in the more robust form, with the legs more incrassate; in the much shorter and smaller enclosure of propodeum, and in the comparatively coarse sculpture.

Male—Head rotund, as broad as long, the cheeks and temples not broadened. Labrum twice as broad as long and broadly rounded at apex. Clypeus rather large and about one and one-half times longer than labrum. Subantennal sutures obsolete. Proboscis short, the blade of the maxillae about twice as long as broad and shorter than the maxillary palpi; mentum and submentum wanting; maxillary palpi with six nearly equal joints; labial palpi about three-fourths as long as maxillary pair, the first joint nearly as long as the next three united, the fourth inserted on the side of the third joint and barely longer than either the second or third. Antennae inserted slightly below the middle of face, rather short and stout, the joints of flagellum as thick as long. Wings with three submarginal cells, the third nearly as long as

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the first and the second small; first recurrent nervure interstitial with the second intercubitus; basal nervure moderately curved. (Wings similar to those of *Dufourea,* except for the three submarginal cells.) Propodeum with a short dorsal surface and large posterior face, the basal area smooth, with a rugose band across the base. Legs moderately incrassate, the tarsi somewhat longer than the tibae; hind basitarsi swollen, about three times longer than wide and two-thirds as thick as the hind tibiae, and subequal in length to the following tarsal joints combined; apical joint of tarsi and the claws stout, the latter bifid at apex. Abdomen ovate and about one and one-half times longer than wide when normally contracted, the apex without a well-defined pygidial area. Apical margin of the sixth ventral segment slightly reflexed and with a broad rounded emargination in the middle. Seventh and eighth ventral segments small, the eighth with a narrow median process, a little dilated at apex; seventh with a bilobed basal part supporting a two-lobed plate on each side. Sculpture much as in *Dufourea (s. str.),* with close stung punctures on the head, thorax, and abdomen; the tergites of abdomen, however, more or less broadly smooth and impunctate at apex. Pubescence moderately short and dense, about as in *Dufourea,* but hair of face below level of antennae no denser than elsewhere; hair of abdomen uniformly short and erect, without bands, becoming moderately longer and denser at apex; but that of venter forming thin bands across apex of segments 2 to 5 and becoming very short, dense, and velvety in a medioapical area on segments 2 to 4.

Female.—Similar to the male in most characters. Face without foveae. Clypeus with an apical, convexly arcuate groove, invested with long hairs and bounded above by an elevated sharp margin, the convexity of the groove and margin causing a small recess where they bend backward from the straight edge on each side. Flagellum of antennae more incrassate toward apex than in the male, but less clavate than in *Dufourea.* Scopal hair of hind tibiae and basitarsi rather long and dense, the hairs simple; tibial spurs slender and minutely serrate on inner side; tarsal claws with the inner tooth subbasal and half as long as the outer tooth. Pygidium normally concealed by the fifth tergite and apical fimbria. Sculpture as in male, except that of the clypeus is much coarser, and the punctures of abdomen are much finer and sparser.

Type of genus: *Protodufourea wasbaueri.*

Protodufourea parca Timberlake, new species

Male.—Black, the flagellum reddish ferruginous beneath, the tarsi dark ferruginous. Apical depression of tergites 2 to 6, tergite 7, and the apical margin of tergite 1 somewhat ferruginous. Tegulae dark-amber color. Wings somewhat dusky (reddish), the stigma and nervures ferruginous.

Head as long as wide and thin fronto-occipitally, with the cheeks hardly as wide as the eyes, and inner orbits slightly converging anteriorly. First two joints of labial palpi stout, the fourth very slender, inserted on the side of the third joint and a little longer than either the second or third. Lateral ocelli as far removed from eye margins as their distance apart, and the median ocellus not more than half its diameter in advance of the lateral pair. Head, thorax, and abdomen finely, closely, and nearly uniformly punctured,

the punctures mostly about two to three times their own diameter apart; punctures of clypeus coarser and forming a slight rugosity. Head and thorax mostly shining and more or less polished between the punctures; the propodeum slightly dullish from almost dense minute punctures, but the enclosure polished except for a rugose band across the base. Abdomen a little dullish, with the smooth, impunctate apical depression of the tergites comprising about one-fifth of the length of the segments. Pubescence whitish, becoming slightly ochraceous at apex of abdomen and pale fulvous on inner side of tarsi. Hair band on ventral segments 2 to 4 arcuate in middle to enclose a nearly semicircular apical patch of pale, velvety pubescence. Length, 7 mm.; anterior wing, 5.2 mm.

One male (holotype), CORONA, RIVERSIDE COUNTY, CALIFORNIA, March, 1914 (George R. Wilson), in collection of the Citrus Experiment Station.

Protodufourea wasbaueri Timberlake, new species

Similar to *P. parca* but pubescence brownish to black throughout, the velvety pubescent area on ventral segments 2 to 4 narrow and black, the wings grayish dusky, with dark nervures, and the eighth ventral plate more expanded at apex.

Male.—Black, the tegulae and claws slightly reddened, the tibial spurs testaceous. Wings grayish dusky, the nervures dark sepia or blackish, the stigma with a narrow, central reddish streak.

Structure and sculpture nearly as in *parca*, but rugose area of enclosure broader and covering most of dorsal surface of propodeum; posterior face of propodeum shining and with sparse minute punctures, but the flanks dullish and densely punctate on the inner half; abdomen more shining, the punctures a little stronger and sparser than in *parca*, with the apical depression comprising about one-fourth of the length on tergites 2 and 3. Maxillary and labial palpi not greatly different in length, the third to fifth joints of maxillary pair shorter than the other joints, and the labial palpi not incrassate at base. Pubesence brownish, intermixed with black on clypeus and becoming black on abdomen beyond the first tergite and more or less black on the legs; velvety pubescent area on apical middle of ventral segments 2 to 4 narrowly transverse and black, that on segment 2 narrowest and that on 4 shortest. Apical lobe of the paired plates of the seventh ventral segment much larger than the triangular proximal lobe, which is blackish (in *parca* both lobes pale ferruginous and subequal in size, with the proximal one subquadrate and rounded on outer margin and the distal one expanding toward the rounded apex.) Length, with abdomen contracted, 5.5 mm.; anterior wing, 4.5 mm.

Female.—Very similar to the male in size, color and sculpture, but differing in certain respects as detailed under the generic description. Clypeus, except across the base, with coarse, very shallow pits or punctures, which are separated by broad ridges. Hair on disk of tergites 1 to 3 shorter and sparser, and the apical fimbria denser than in the male. Hair of legs much

longer and denser than in the male and more blackish, although with a brownish cast in some light. Length, 7 mm.; anterior wing, 4.8 mm.

One male, 3 females (holotype male, allotype, and paratypes), GEM MINE, IDRIA, SAN BENITO COUNTY, CALIFORNIA, on *Emmenanthe penduliflora*, var. *rosea* Brand, June 29, 1955, and 1 male (paratype), 6 miles south of Idria, June 14, 1955 (Marius Wasbauer).

According to Mrs. H. Sharsmith, of the University of California Herbarium, who identified the flower visited by this bee, the var. *rosea* is a rare plant, apparently a serpentine endemic and appears more abundantly following a fire.

BOOK REVIEW

A MANUAL OF THE DRAGONFLIES OF NORTH AMERICA (ANISOPTERA) INCLUDING THE GREATER ANTILLES AND THE PROVINCES OF THE MEXICAN BORDER. By James G. Needham and Minter J. Westfall, Jr. xii + 615 pp., col. frontisp., 341 text figs., many tables. University of California Press, Berkeley. 1955. Price $12.50.

The format is attractive, the contents well planned, the printing and binding nicely done. The illustrations are clear and show chiefly wing venation, the mature nymph, and the terminal appendages of the male; indeed much of the appeal of the volume is due to the many excellent photographs by the junior author. Part I (60 pp.) comprises Introduction, Field Studies, and Procedure, the last including a list of the genera and species treated, with pronunciations. Part II contains the Systematic Classifications, a two-page Glossary, and a list of Synonyms, which are separated from and not included in the general index.

One may quibble over such things as the use of "joint" rather than "segment" in describing parts of the leg, but they are small points in a fine book. Because it is readily usable by the amateur it should stimulate a wider general interest in Odonata. There is a fine chance for the hobbyist to make original observations, especially in life history studies. The authors have given a stimulus by citing, at the ends of keys, the names of genera and species for which nymphs are still unknown. A second volume, on the Zygoptera or damselflies, is in preparation.—HUGH B. LEECH, *Department of Entomology, California Academy of Sciences, San Francisco.*

ERIOPHYID MITES—NOTES AND NEW SPECIES

(Acarina)

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The following additions to the mite fauna of California not only add seven species to the State list but also implicate five new hosts.

Aceria pynocephalae Keifer, new species

(Figures 1 da, 1 es, 1 f)

Female 160–220μ long, 45–50μ thick; wormlike; color whitish-yellow. Rostrum 25μ long, projecting forward and down. Shield 30μ long, 35μ across, subtriangular; design clear: median line complete or broken; admedians extending full length and curving centrad to rear; first submedian lines curving toward and ending at about 2/3 of the admedians; second submedians represented by disconnected curved lines ahead of the dorsal tubercles; third submedians extending diagonally along the upper edge of the lateral granulations. Dorsal tubercles 24μ apart on the rear margin; dorsal setae 35μ long, projecting backwards. Forelegs 35μ long, tibia 7μ long, with seta; tarsus 8μ long, claw 11μ long, slender, tapering; featherclaw 5-rayed. Hindlegs 30μ long, tibia 6μlong, tarsus 8μ long, claw 11μ long. Coxae with granulations and lines, the anterior coxae broadly connate. Abdomen with 80–85 rings; completely microtuberculate, the microtubercles a little elongate and pointed; microtubercles smaller on cauda. Lateral seta 26μ long, on ring 12; first ventral seta 55μ long, on about ring 27; second ventral 15μ long, on ring 45; third ventral 23μ long, on ring 6 from rear. Accessory seta present. Female genitalia 21μ wide, 16μ long, coverflap with 12–14 longitudinal furrows; seta 15μ long.

Male not seen.

Type locality: SAN FRANCISCO, CALIFORNIA. Collected: Aug. 3, 1952 by the writer. *Host: Artemisia pycnocephala* DC. (Compositae). *Relation to host:* The mites live in the buds, especially the flower buds which grow in tolerably long spikes. No damage by the mite has been noted although the mite population is considerable. *Type material:* A type slide and five paratype slides bear the above data.

On page 14 of Vol. 2, No. 1 of the Bull. Calif. Insect Survey the new species runs to *calibaccharis* (Keifer) in the key. However, *pycnocephalae* has a shortened first submedian line whereas *calibaccharis* has a full length first submedian line.

Aceria sphacelina Keifer, new species

(Figures 2 da, 2 es, 2 f)

Female 140–180μ long, 40–45μ thick; wormlike; light amber in color. Rostrum 25μ long, curved down. Shield 25μ long, 30μ wide, noticeably

humped to rear; design distinct with the median line somewhat broken and ending in a dart-shaped mark; admedians undulating slightly, gradually diverging, hardly recurving at rear; first submedians indistinctly forked in front of tubercles, the second submedians shorter; third submedians along upper edge of lateral granular area. Dorsal tubercles 23μ apart, on rear margin; dorsal setae 26μ long, projecting backward. Forelegs 27μ long, tibia 5.5μ long, with seta; tarsus 7μ long, claw 10μ long, tapering; featherclaw 4-rayed. Hindlegs 23μ long, tibia 4.5μ long, tarsus 6μ long, claw 9.5μ long. Coxae slightly marked, the anterior coxae broadly connate. Abdomen with 65–70 rings; completely microtuberculate, the microtubercles each extended into a short spinule. Lateral seta 23μ long, on about ring 8; first ventral seta 38μ long, on about ring 21; second ventral 13μ long, on about ring 38; third ventral seta 19μ long, on about ring 6 from rear. Accessory seta present. Female genitalia 18.5μ wide, 10μ long, coverflap with 10–12 longitudinal furrows; seta 10μ long.

Male not studied.

Type locality: THREE MILES WEST OF SHINGLE SPRINGS, EL DORADO COUNTY, CALIFORNIA. Collected: June 29, 1952, by the writer. *Host: Sphacele calycina Benth.* (Labiatae, Pitcher sage. *Relation to host:* The mites live around the small leaves as they emerge from the bud; also within the peiole bases. No damage to the host has been noted. *Type material:* A type slide and six paratype slides bear the above data.

This mite is also found in the Paradise region of Butte County, the collection July 7, 1939, by the writer. None of these specimens are now on hand. In the key to California species of *Aceria* (cited above) this mite runs to *Aceria chrysopsis* (Keifer), but differs in not having recurved submedian lines. *Aceria sphacelina* differs from *Aceria neosalviae* (Keifer) by possessing spinuliferous microtubercles, as well as other features.

Aceria populinquis Keifer, new species

(Figures 3 da, 3 es, 3 f)

Female 200–240μ long, 55μ thick, wormlike, tapering; color yellowish-white. Rostrum rather large, 38μ long, curving down. Shield 36μ long, 46μ wide; design very faint: a short median line to rear, with the admedians apparently extending full length, and connected to the anterior end of the median by diagonal lines at the 2/3 point on the shield; lateral granular area present. Dorsal tubercles 35μ apart, on rear margin; dorsal setae 36μ long, projecting caudad. Forelegs 40μ long, tibia 10μ long, with seta arising close to base; tarsus 10μ long, claw 7μ long, curving down, slightly knobbed; featherclaw 4-rayed. Hindlegs 37μ long, tibia 8μ long, tarsus 9μ long, claw 10μ long. Coxae with some tubercles, the anterior coxae broadly connate. Abdomen with 60–65 rings, completely set with microtubercles, each microtubercle produced into a spinule; posterior rings broader and sharper dorsally in lateral view, slight ventrad doubling. Lateral seta 22μ long, on about ring

9; first ventral seta 60μ long, on about ring 22; second ventral seta 22μ long, on ring 40; third ventral seta 35μ long, on ring 6 from rear. Accessory seta present. Female genitalia 23μ wide, 14μ long, coverflap with 9–12 longitudinal furrows; seta 27μ long.

Male not seen.

Type locality: SACRAMENTO, CALIFORNIA. Collected: June 15, 1952, by the writer. *Host: Populus fremontii* Wats. (Salicaceae), Cottonwood. *Relation to host:* The mites live in the large pendant male catkin galls formed by *Aceria neossigi* (Keifer) and are inquilins in these galls. They inhabit the recesses at the base of the fasciated outgrowths from the catkins, browning the surfaces, and possibly contributing to the decline of the gall. *Type material:* A type slide and five paratype slides bear the above data.

All other California species of *Aceria* with 4-rayed featherclaws, have a much more distinct median line on the shield. The rear of the abdomen suggest the genus *Paraphytoptus*. In this case we have an Eriophyid mite which works against the best interests of another Eriophyid.

Aceria trichophila Keifer, new species

(Figures 4 da, 4 es, 4 f)

Female 200–230μ long, 35μ thick, a very slender species, light yellowish in color. Rostrum 20μ long, projecting ahead and down. Shield 27μ long, 25μ wide, median line present to rear; admedian lines strong, undulating, curving centrad slightly at rear margin; one prominent submedian line anteriorily, forking part way back into two additional lines of more or less clarity, and ending ahead of dorsal tubercles; sides of shield not granular. Dorsal tubercles 16μ apart, on rear margin; dorsal setae 23μ long, with seta; tarsus 6μ long, claw 8μ long, tapering; featherclaw 3-rayed. Hindlegs 30μ long, tibia 6μ long, tarsus 9μ long, claw 9μ long. Coxae somewhat tuberculate, the anterior coxae touching. Abdomen with 63–68 rings completely set with microtubercles, the microtubercles acuminate. Lateral seta 23μ long, on ring 4; first ventral seta 28μ long, on about ring 17; second ventral 10μ long, on about ring 31; third ventral 22μ long, on ring 5 from rear. Accessory seta present. Female gentialia 20μ wide, 15μ long, the coverflap with about 10–12 longitudinal furrows; seta 9μ long.

Male not seen.

Type locality: THREE MILES WEST OF SHINGLE SPRINGS, EL DORADO COUNTY, CALIFORNIA, NEAR HIGHWAY. Collected: June 29, 1952 by the writer. *Host: Quercus douglasii* H&A. (Fagaceae), Blue oak, a deciduous tree. *Relation to host:* The mites produce baggy erineum-filled leaf galls varying from ¼ to ½ inch in size. *Type material:* A type slide and five paratype slides bear the above data.

This species with its 3-rayed featherclaws fits into the distinc-

tive Fagaceous-Juglandaceous group of species in the genus *Aceria*. The presence of a median line on the rear of the shield, together with strong admedian lines distinguishes *trichophila* from *mackiei* and *paramackiei*, the two similar oak mites already on the California list. The new species is notably slender. It is the first erineum mite to be described from a deciduous oak in California. At the date of the original collection, June 29, the erineum (or galls) contained many mites. On Aug. 12, 1952, the same tree showed that the mites had already abandoned the erineum. While the infested tree is in a considerable grove of the same species of oak no other tree showed evidences of infestation.

Aceria anserina Liro

(Figures 5 da, 5 es, 5 f)

Eriophyes anserinus Liro, Ann. Zool. Soc. zool-bot. Fen., Vanamo 9:12–13, 1943 (No. 3)

Eriophyes (Aceria) anserinus Liro, Liro and Roivainen in Animalia Fennica #6, p. 80, 1951 (in Finnish)

Locality: Bodega Bay, Sonoma County, California. Collected: Aug. 9, 1952 by J. P. Keifer, and the writer. *Host: Potentilla anserina* L. (Rosaceae), Silver-weed. *Relation to host:* The mites live among the dense silvery hairs on the undersides of the leaves. The host shows no damage.

The mite as it occurs in California is 200–250.. long and 50.. thick. The featherclaws are 5-rayed and the microtubes are rounded. On the shield the median line is represented by a series of dots on the rear half of the shield; the admedians are complete and flare outward at the rear; the submedians are of lines of dots or microtubercles and the first forks in front of the dorsal tubercles; the shield sides are entriely granular. No other species of *Aceria* known in California has the combination of a 5-rayed featherclaw and a median line composed of a row of dots.

Potentilla anserina L., silver-weed, has a holarctic distribution, coming down the Pacific Coast to Southern California. It is the only known host of *Aceria anserina*. Liro's figure, showing the flaring admedian lines, indicates the identification of this mite in California.

Eriophyes lithocarpi Keifer, new species

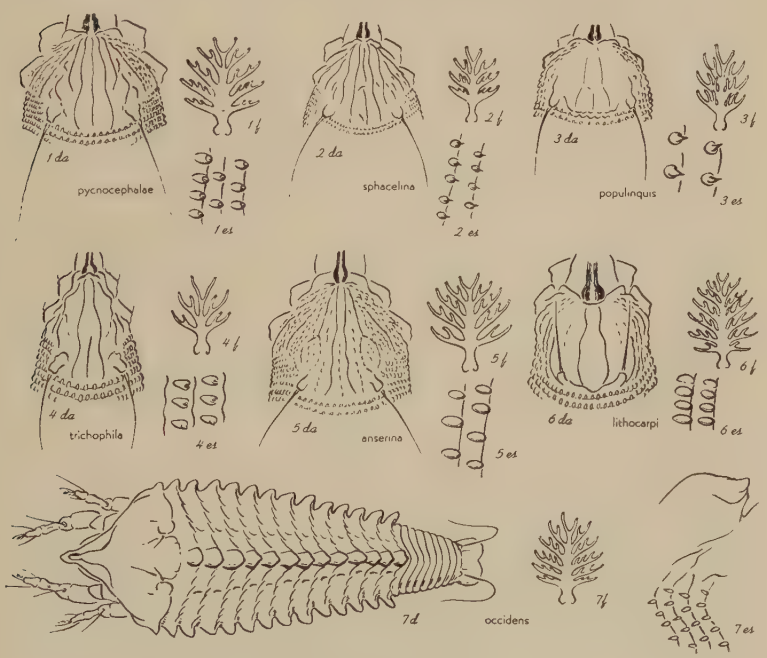
(Figures 6 da, 6 es, 6 f)

Female 150–180μ long, 35–40μ thick, wormlike, whitsh-yellow. Rostrum 27μ long, projecting forward and down. Shield 25μ long, 30μ wide; median line absent: admedians complete, subparallel, abruptly curving farther apart

just before middle, curving centrad at rear; sides of shield with lines curving out and forward from just below dorsal tubercles, and some granules below these. Dorsal tubercles 13μ apart, inclined forward from the rear margin; dorsal setae 22μ long, projecting up and forward. Forelegs 30μ long, tibia 7μ long, with seta; tarsus 8μ long, tapering; featherclaw 7-rayed. Hindlegs 25μ long, tibia 4μ long, tarsus 7μ long, claw 10μ long. Coxae with a few lines, the anterior coxae touching. Abdomen with 53–60 rings, the rings completely set with elongate, apically rounded microtubercles. Lateral seta 24μ long, on about ring 6; first ventral seta 30μ long, on about ring 16; second ventral 22μ long, on about ring 29; third ventral seta 18μ long, on ring 6 from rear. Accessory seta very small. Female genitalia 20μ wide, 11μ long, coverflap with a row of basal microtubercles and 12 to 14 longitudinal furrows; seta 8μ long.

Male 125μ long, 35μ thick.

Type locality: THE SOUTHWEST RIDGE ON MT. TAMALPAIS, MARIN COUNTY, CALIFORNIA. Collected: Aug. 3, 1952 by the writer.



EXPLANATION OF PLATE

d, dorsal view of mite; da, dorsal view of the cephalothoracic shield; es, diagram of the side skin structure; f, featherclaw.

Fig. 1, *Aceria pycnocephalae*. Fig. 2, *Aceria sphacelina*. Fig. 3, *Aceria propulinquis*. Fig. 4, *Aceria trichophila*. Fig. 5, *Aceria anserina*. Fig. 6. *Eriphyes lithocarpi*. Fig. 7, *Oxypleurites occidens*.

Host: Lithocarpus densiflora (H&A) (Fagaceae), Tanbark oak. *Relation to host:* the mites live around the buds, especially the terminal buds. They apparently do not harm their host. *Type material:* a type slide and five paratypes bear the above data.

This is the first California species of *Eriophyes* to be described that has a 7-rayed featherclaw. It is allied to some other California *Eriophyes* by the general features of the shield on which the lateral lines curve forward from below the dorsal tubercles and frame the shield center. This species is quite a contrast to the 3-rayed featherclaw members of *Aceria* that are normally found on Fagaceous trees. The explanation of the presence of this mite may possibly await the exploration of the Asiatic species of *Lithocarpus*.

Oxypleurites occidens Keifer, new species

(Figures 7 da, 7 es, 7 f)

Female 190–200μ long, 65–70μ wide, 45–50μ thick; fusiform in dorsal view; color in life reddish. Rostrum 30μ long, projecting down. Shield 55μ long, 60μ wide; anterior lobe projecting well over rostrum, spear-shaped apically, apparently grooved; central area of shield logitudinally raised. Dorsal tubercles 22μ apart, a little ahead of rear margin; dorsal setae 8μ long, projejcting diagonally ahead and up. Forelegs 36μ long, tibia 9μ long, with seta; tarsus 7μ long, claw 7.5μ long, tapering; featherclaw 6-rayed. Hindlegs 34μ long, tibia 7μ long, tarsus 6μ long, claw 7.5μ long. Coxae somewhat roughened with some tuberculation, the anterior pair but narrowly contiguous. Abdomen with 22 tergites, the first 13 of which form a serrate logitudinal middorsal ridge and have correspondingly projecting side teeth; the remaining 8 or 9 rings simple. Sternites about 70, narrow and closely set with microtubercles. Lateral seta 26μ long, on about sternite 8; first ventral seta 13μ long, on about sternite 26; second ventral 14μ long, on about sternite 46; third ventral seta 18μ long, on sternite 5 from rear. Accessory seta small. Female genitalia 26μ wide, 15μ long, coverflap basally with transverse roughenings and 9 or 10 longitudinal furows; seta 12μ long.

Male not seen.

Type locality: Sandy Camp, Hat Creek, Shasta County, California. Collected: Aug. 17, 1952, by the writer. *Host: Juniperus occidentalis* Hook. (Cupressaceae), Sierra Juniper. *Relation to host:* The mites are vagrants on the green branchlets, especially on vigorous tips. They are not common and apparently do no damage. *Type material:* a type slide and five paratype slides bear the above data.

No other species of *Oxypleurites* so far found in California has more than 4-rayed featherclaws. The new species bears a 6-rayed structure. The dorsal and lateral serrations ending abruptly at the 13th tergite are also definitive.

Calacarus carinatus (Green)

Typhlodromus carinatus Green, in Insect Pests of the Tea Plant, 1890
Phytoptus theae Watt and Mann, The Pests and Blights of the Tea Plant, p. 366, 1903
Eriophyes carinatus (Green), Nalepa, Marcellia 25:133, 1929
Eriophyes carinatus (Green), King, Bul. Ent. Res. 28:311–14, 1937
Epitrimerus adornatus Keifer, Bul. Cal. Dept. Agr. 29:32, 1940
Calacarus adornatus (Keifer), Bul. Cal. Dept. Agr. 29:164, 1940
Calacarus adoratus (Keifer), Bul. Cal. Ins. Surv. (UC), 2:41, 1952

This is the purple or ribbed tea mite of Asia. Nalepa, in the above cited reference considered that the names *carinatus* and *theae* were nude names and unusable taxonomically. This probably makes *adornatus* the first name proposed for this mite which was accompanied by an illustration of the mite. However, the writer feels that substituting *adornatus* for *carinatus* at this late date would only confuse the literature, and that therefore *carinatus* should stand. But it is necessary to correct the generic placement since the species is in no way related to the genus *Eriophyes*.

The genus *Calacarus* now contains four species. Two of these, *pulviferus* and *tejonis* are native on California oaks. *C. carinatus* has come to California on camellia from the orient. The additional species, *gei* Liro (Ann. Ent. Fenn. 8:77–78, 1942), occurs on *Geum rivale* L. in Finland. This latter species is very similar to *carinatus*. The species are all deep purple in color with longitudinal white wax stripes, and are beautiful mites if that adjective can be applied to Eriophyids.

The hosts of *Calacarus carinatus* are: tea *(Thea chinensis* L.) and camellia. In asia the mite is said to increase in numbers during dry periods. The long dry California summers are very favorable to the development of this mite.

This synonymy is possible through the help of Dr. A. M. Boyce, Director of the Citrus Experiment Station at Riverside, California. He arranged to have specimens of the purple tea mite sent to the writer from Ceylon. Dr. G. D. Austin, of the Tea Research Institute of Ceylon, sent the specimens, stating that they were collected at Talawakelle, November 26, 1952. Talawakelle is a hill station at 4500 feet elevation.

Platyphytoptus sabinianae Keifer

Keifer, 1952, Calif. Insect Survey, Univ. Calif. Press, 2:53.

Prof. G. F. Knowlton, of the Utah State Agricultural College at Logan, has been active in the collection of pine Eriophyids. Due

to his efforts it is possible to report the first localities outside of California inhabited by *sabinianae*. The writer had previously supposed this mite to be confined to California, west of the Sierras, but Knowlton's work indicates it is widespread in Utah. His 1952 collecting records are:

Ogden, Dec. 23, on *Pinus nigra* Arnold, Austrian pine; Providence, Dec. 27, on *Pinus sylvestris* L., Scotch pine; Cove, Dec. 30, on *Pinus* sp.

SETOPTUS JONESI (Keifer)

Bull. Calif. Insect Survey, Univ. Calif. Press, 2:20, 1952

Prof. Knowlton collected this mite on limber pine, *Pinus flexilis* James, at Logan, Utah, Jan. 3, 1953. This is also the first collection of this mite outside of California.

DESCRIPTION OF A NEW SPECIES OF PHLOEOSINUS AND REMARKS REGARDING THE LIFE HISTORY AND HABITS OF RENOCIS HETERODOXUS CASEY

(Coleptera: Scolytidae)

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Blackman[1] recognized 40 species as members of the genus *Phloeosinus* in American north of Mexico—the great majority of which are found in the western United States. The members of the genus are commonly referred to as the "Cedar Bark Beetles" since all but three of the hitherto known forms attack cupressine or taxodiine trees. The species which do not conform to this general rule are *Phloeosinus pini* Swaine, which breeds in *Pinus strobus* and *P. banksiana;* and *Phloeosinus piceae* Swaine and *P. alaskanus* Blackman which breed in *Picea canadensis*.

It was a pleasant surprise, therefore, when the writer reared a considerable number of insects, belonging to this genus, from *Pseudotsuga taxifolia* in 1951. In April on a trip into southern Oregon an unusual number of red twigs were noted on Douglas fir saplings and reproductions. Believing this to be the work of *Cylindrocopturus furnissi* Buchanan, samples were brought into the laboratory and placed in breeding cages. As was expected, a large series of *C. furnissi* emerged in late May. The cages were

[1] Revision of the genus **Phoeosinus** Chapius in North America. Proc. U. S. Nat. Mus., 92:397-474, 1942, W. M. Blackman.

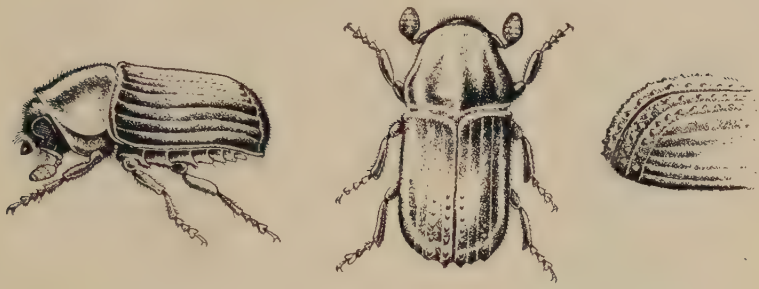

Fig. 1. *Phloeosinus pseudotsugae* Chamberlin, new species.

allowed to remain and on June 10 a tiny scolytid was noted and within the next ten days some 20 specimens emerged. Following is a description of the new species.

Phloeosinus pseudotsugae Chamberlin, new species

Piceous-brown to nearly black; posterior half of elytra nearly brick red, less shiny; length 1.67–2.06 mm.; approximately twice as long as wide. Frontal rectangle as long or slightly longer than wide; epistomal lobe broad almost hidden by a fringe of golden hairs. Frontal concavity more than half as wide as the distance between the eyes, median carina scarcely evident and variable in length, when evident usually elevated with a smooth area at lower half of the frontal cavity. Frons with fine abundant golden hairs, more numerous and longer along the margin of the epistomal lobe. Emargination of the eyes about one-third the entire width; eyes almost black. *Antennal club* compressed, twice as long as wide, with 3 sutures[2] on the outer face, first somewhat sinuate and widely septate for more than one-half its length. Second nearly straight and septate, outer suture scarcely visible, in fact, it is quite impossible to detect it except at the most favorable angle. Pronotum one-fourth wider than long, widest near the middle, rather strongly narrowed anteriorly, posterior angles only slightly rounded, surface rather uniformly, coarsely, closely punctured not granulate; median line barely evident, except near the base where it is slightly more distinct. An evident impression across the dorsum just posterior to the anterior margin; vestiture of very fine short hairs. *Elytra* slightly wider than the pronotum; front angles rounded; sides nearly straight and parallel for three-fourths their length; regularly rounded posteriorly; width to length approximately 7:9. Scutellum broad, crescent shaped and depressed. Front margins of elytra slightly but distinctly elevated with granulations on the elevation. Puctures rather indefinite; interspaces slightly wider than striae. Second interspace widened at base. Striae strongly elevated, wider than the interspaces on the declivity. Second interspace narrower than first and third, serrations feeble; first and third interspaces distinctly more elevated than the second. Striae one and two coalese near the apex of the elytra; interspaces with numerous scale-like hairs.

[2] Only two sutures are apparent in the club of some specimens. In examining specimens of **P. piceae** the terminal suture is very faint, often not visible.

A series of about 20 specimens were reared from Douglas fir twigs collected in the vicinity of Canyonville, Oregon, in April, 1951. Adult beetles emerged in the laboratory the week of June 15, 1951.

According to Blackman's key, the species definitely falls in the first group: species which attack hosts other than cedar. I have not seen specimens of *P. alaskanus* Blackman but from *P. pini* Swaine and *P. piceae* Swaine. The new species differs by its definitely smaller size, is much less robust, is less shining, and the striae and interspaces are less evident, the posterior half of the elytra are distinctly reddish brown. Asperities evident only on the declivity and the first and third interspaces which are distinctly more elevated than the second.

The species breeds in small twigs (1/8 inch in diameter) of living, apparently healthy, Douglas fir. In several instances it infested twigs in which *Cylindrocopturus furnissi* were breeding.

Type locality: TILLER, OREGON (22 MILES NORTHEAST OF CANYONVILLE, DOUGLAS COUNTY, OREGON). Type in author's collection: paratypes will be deposited in the California Academy of Sciences, the U. S. National Museum, the Canadian National Collection, and in the Oregon State College collection.

I am indebted to Dr. Edward C. Becker of the Department of Entomology, Science Service, Ottawa, Canada, for the loan of a considerable series of *Phloeosinus piceae* Swaine and paratypes of *P. swainei* Bruck and *P. pini* Swaine.

The drawing accompanying this article were drawn by Hugh Hayes of the Oregon State Department of Forestry, Salem, Oregon.

RENOCIS HETERODOXUS Casey

No reliable information upon the habits of the mountain mahogany bark beetle have hitherto been published; as a matter of fact, the insect has been considered as a rather uncommon bark beetle of little economic importance until recently. In February, 1951, specimens of mountain mahogany *(Cerocarpus)* were brought in from the Summer Lake area of southearstern Oregon, showing the work of this beetle, and considerable concern was felt by those interested in wild life. There was a widespread epidemic of the beetle and quantities of mountain mahogany, which forms the principal browse plant for deer in the area, were being killed. Since the life history was unknown, arrangements were made to have samples submitted at frequent intervals and the following

EXPLANATION OF FIGURES

Fig. 2. The Mountain Mahogany Beetle, *Renocis heterodoxus* Casey.
Fig. 3. Gallery of *Renocis heterodoxus* Casey in Mountain Mahogany.

account is given based upon studies made from the material, which was placed in breeding cages in the laboratory at Corvallis.

The adults (fig. 2) are very small beetles (1.5 to 2.5 mm. long) of a grayish-black color; wing covers are very much roughened and covered with scale-like hairs; head is scarcely visible from above; mandibles are surorunded by long, stiff, white hairs. The very small larvae are white, wrinkled and of a typical scolytid form.

The species are monogamous and enter the host plant in July. The pair excavates an unusual chamber which is roughly oval 4 x 6 mm., deeply engraving the wood; extending out from this chamber there are three to six, typically five, finger-like short galleries (fig. 3) from one to three mm. long. At the end of each, six to twelve eggs are deposited; from there, the larval galleries extend out an average of about three-fourths of an inch; they engrave the wood rather deeply. The oval pupal cells are about three-fourths in the wood and one-fourth in the bark. The adults

exit through the thin bark, leaving a circular exit hole about .75 mm. in diameter.

The adults apparently over-winter in the galleries and eggs are deposited in March. Well-grown larvae were found April 8 and pupae were observed May 15. Newly formed, partially colored adults were present on June 1. These were fully colored and mature by June 25 and excavated some irregular areas under the bark, possibly for food, but did not emerge until late July, after which they made new entrance tunnels, often in the same section from which they had emerged, and deposited eggs. Owing to prolonged absence from Corvallis, further observations were not possible at that time.

The actions of these beetles in breeding cages differs from other scolytids under similar conditions. They mate and re-enter the sections of mountain mahogany without coming to the glass vials. During the two years they have been in the cages, almost no adults appeared in the vials until beginning in March, 1953, and since that time, a considerable number have been coming to the light. They continue to breed in the mahogany limbs which are very dry and exceedingly hard.

Two undescribed species of hymenopterous parasites were taken in very limited numbers from the breeding cages.

INTERNATIONAL CONGRESS OF ENTOMOLOGY

The Tenth International Congress of Entomology will be held in Montreal, Canada, from August 17 to 25, 1956. The meetings will be held at McGill University of Montreal.

The sections of the Congress have been arranged provisionally as follows: (1) Systematics, (2) Morphology and Anatomy, (3) Physiology, (4) Behaviour, (5) Ecology, (6) Geographical distribution, (7) Genetics and Biometrics, (8) Palaeontology, (9) Arachnida and other land arthropods, (10) Forest Entomology. (12) Medical and Veterinary Entomology, (13) Stored Products Entomology, (14) Biological Control, and (15) Apiculture.

Those persons wishing to receive further information with a view to attending the Congress should notify Secretary J. A. Downes, Division of Entomology, Science Service Building, Ottawa, Ontario, Canada.—*Editor.*

NEW GENERA OF MAYFLIES FROM CALIFORNIA

(Ephemeroptera)

W. C. DAY

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In September of 1953 Charles Warren, then a graduate student at the University of California, brought to me for identification a number of tiny mayfly nymphs which he had collected with a bottom sampler in the course of conducting a pollution study of the lower Tuolumne River. The most curious of these was a species of Baetinae having bowed tarsi with distal truncate, spatula-like appendages armed with one large and eight or nine lesser claws.

Searching for this unique species during 1954, the writer and his wife, Helen L. Day, made numerous trips to the Tuolumne River, collecting some ten miles above and below Modesto. The spatula-clawed Baetinae nymph has been reared and found to be an aberrant form of the genus *Baetis*. It is apparently identical with the nymph described by Dr. Traver in 1944 as Baetine No. 1, from Brazil.

Two additional forms of Baetine nymphs were reared from the 1954 collecting on the Tuolumne River which, in the author's opinion, cannot be included in any known genus of the Ephemeroptera. The male adults of both are inseparable from *Pseudocloeon* and from each other, yet the three-tailed nymphs are quite dissimilar from the two-tailed nymphs of *Pseudocloeon*, and from each other. It is the purpose of this paper to propose the new genus *Paracloeodes* based on the type species *P. abditus* and the new genus *Apobaetis* based on the type species *A. indeprensus*, and to name and describe the nymphs as the holotypes of the type species.

Paracloeodes Day, new genus

Adult: Very small mayflies, the male adult with body about 3.5, forewing 3.5, foreleg 3.0 and tails (2) 5.5 mm. long. Female with body averaging 4.5, forewing 4.5, foreleg 2.0 and tails (2) 5.0 mm. long. Hindwings absent. Turbinate eyes of male not contiguous, very large and set on stalks about .25 mm. in height when measured up the outer sides. Eyes of female widely separated, 1.7 times the distance apart as their longest axis. Posterior margin of head of female definitely emarginate. Foreleg of male with tibia and tarsus subequal, each one-half longer than femur; proportionate lengths of tarsal segments 1 to 5 being respectively 1, 15, 12, 6 and 4. Hindleg of male with tibia and femur subequal and tarsus one-half this length; proportionate lengths of tarsal segments 1 to 4 being respectively 4, 3, 2, and 5. Propor-

tions of tarsal segments of hindleg of female as in male. Tibio-tarsal joint in male and female strongly fused but marked by diminished thickness of tarsus. All leg segments beset with numerous minute, hair-like spinules. Marginal intercalaries of forewing paired, of medium length, and well developed in both male and female, at least from costa through radial sector. Venation of forewing as in figure 24. In the female, the apical margin of sternite 9 is very slightly produced. Genitalia of male adult with first segment of forceps extremely long, second and third joints fused, and length of fourth segment about four times its thickness; broad, domed penes cover present in type species. Two tails.

Nymph: Slender, streamlined. Length of body of male averages 3.75, legs, all of equal length, 1.75 and tails (3) 1.5 mm. Length of antennae 50% longer than head. Antero-lateral portion of head deeply cut away, exposing mouthparts; posterior margin straight. Each mandible with canines fine and rounded at tips, of moderate length and divided to base into two groups; prostheca asymmetrical; without spines or hairs between canines and molars. Right mandible (fig. 9) with large tooth at center of molars. Left mandible (fig. 10) with single large tooth above molars. Maxilla (fig. 11) notably light and slender with robust, two-jointed palp extending almost half its length beyond tip of galea-lacinia. Labial palp (fig. 12) two-jointed and of distinctive and unusual form, with outer apical margin terminating in a sharp point and inner apical margin forming a large, smoothly rounded lobe. Pronotum three times as wide as long; anterior margin straight and posterior margin widely excavated. Anterior margin of first tergite with wide, deep median slot into which fits the mesonotal scutellum. Tergites with short, fine spinules on posterior margins; postero-lateral corners without spines. Legs (fig. 26) with tibia 60% the length of femur and tarsus slightly shorter than tibia. Claws slightly curved and hooked at ends, over half as long as tarsi, and with 18–20 fine, straight denticles on inner margin of basal portion. Gills single, ovate, hyaline white, and with strongly marked dark central trachea with a few short branches (fig. 8). Three tails, the middle tail 96% as long as outer tails and equally stout. Short hairs on each side of middle tail and on inner sides of laterals.

Type of the genus, *Paracloeodes abditus* Day, new species

Paracloeodes abitus Day, new species

(Figures 7–12 and 19–24)

The morphological details of this species, the type species of the new genus *Paracloeodes*, have been given above. Details that might be expected to be of a specific nature are as follows.

Adult: Entire upper surface of head yellowish white, ocelli narrowly ringed at bases with smoky gray and stalks of male eyes also so ringed. Facets of upper compound eyes of male light golden yellow, lower eyes black. Antennae with scape and pedicle pale, filaments light smoky; two faintly darkened "V" shaped marks between bases. Pronotum pale smoky, anterior margin finely dark. Mesonotum and metanotum yellowish white, faintly outlined in smoky gray; median suture of mesonotum marked lightly with gray. Wings hyaline, colorless, veins white. Abdomen yellowish white,

tergites 1–5 with lateral areas light smoky. Pleural fold intermittently marked with fine, gray geminate lines. Segments 9 and 10 wholly white. Golden eggs of female seen through body wall in complete detail. All legs transparent white; trochanters, tarsal joinings and claws finely outlined in black. Penes cover, second and third segments of male forceps faintly washed with smoky; other segments of forceps white. Tails transparent white.

Male nymph: Length of body 3.7, legs 1.7 and tails 1.5 mm. The morpholigical features of the holotype nymph have been given in the generic description. In *P. abditus* the coloration is basically white with markings in black washes which are never quite opaque. Vertex of head white with faint, broad black wash in area of genae. Anterior and lateral margins of labrum outlined in black. Canines of mandibles and teeth at tips of galea-lacinia black. Scape and pedicle of antenna smoky and each section of flagellum with narrow black margins. Upper and lower portions of eyes distinctly seen, the former yellowish and the latter black. Pronotum white with wide median, submedian and lateral dark stripes from anterior to posterior margins. Mesonotum and metanotum yellowish, margined in black; mesonotum vaguely marbled and speckled in black, and a broad wash of black in antero-lateral corners; a broad wash of black across basal portion of wing-pads. Very wide, strong dark semi-circular stripes over each trochanter. A strong black stripe under middle and hindlegs. Tergite 1 white; 4, 5, 7 and 8 white with dark median and submedian spots on anterior margins; larger and less intense black spots in lateral corners. Tergites 2, 3, 6 and 9 washed with black except for small median white area on posterior margin and wide white band above pleural fold; a strong, large dark spot in median area. Anterior and posterior margins of all tergites finely black. Denticles along all posterior margins black. Sternites white, 1–8 with anterior margins black. Sternite 9 washed and finely outlined in black and with wide dark stripe across anterior portion. Legs with femora white, tibiae, tarsi and claws light smoky and darker at joinings; a prominent dark spot at distal ends of femora. Gills hyaline white, each with a single dark central trachea; branches not darkened. Three white tails of about equal length, dorsal surfaces and all joinings faintly darkened; short white hairs on each side of middle tail and on inner sides of lateral tails.

Holotype: Male nymph mature; collected by Helen L. Day and W. C. Day on Tuolumne River, Stanislaus County, California, about three miles east of Shiloh Bridge, August 7, 1954; in collection of California Academy of Sciences. Topotypical paratype nymphs together with reared male and female adults have been sent to Canadian National collection, to Cornell University, and to G. F. Edmunds, Jr. Twenty-five topotypical paratype nymphs, ten males, ten females, thirty-five nymphal cases and numerous slides in author's collection.

Edmunds and Travers (1954) in their reclassification of the world Ephemeroptera list thirteen valid genera of the subfamily

Baetinae. Of these, but three genera have dipterous male adults with paired intercalaries in the forewing, these three being *Baetiella* Ueno, *Cloeodes* Traver and *Pseudocloeon Klapálek*. As pointed out by Dr. Traver in her paper on the mayflies of Puerto Rico, 1938, the nymph of *Pseudocloeon* has not been reared in the Java type locality for positive association with holotype of the type species of the genus, but nymphs are known to exist in the same faunal region which are similar to those North American nymphs which produce adults that appear identical with the adults of the type species of *Pseudocoloeon*. Traver stated in this connection that until the type species has been reared, she proposed to consider the nymphs described from the Nearctic region as representatives of the true *Pseudocloeon*.

The nymph of *Pseudocloeon* has two tails, canines of mandibles blunt and strongly consolidated, and fused into a single unit as in *Baetis*, glossae narrow and tapering as in *Baetis*, and distal segments of the labial palpi rounded, as in Fig. 25. In the specimens that I have examined, I would judge the labial palpi to be three-jointed.

The adults of the genus *Baetiella* from Japan are apparently identical with those of *Pseudocloeon* while the nymphs of the former differ from those of the latter by the bearing of a long hair near the tip of the claw.

The adults of *Cloeodes*, from Puerto Rico, characterized from the type species *C. maculipes*, can be distinguished from other two-winged mayflies of the subfamily Baetinae that have paired intercalaries in the forewing by the very long basal segment of the tarsi of middle and hindlegs. The three-tailed nymph of *C. maculipes* has two-jointed maxillary palpi, canines blunt and strongly consolidated and fused into a single unit, and three-jointed labial palpi, similar in number of segments and quite similar in form to these same parts in *Pseudocloeon*.

Dr. Traver remarked at the time she established the genus *Cloeodes* and selected *C. maculipes* as the type species that other species placed in this new genus *(C. portericensis, consignatus* and *sp.)* do not agree with the type as to the unusual length of the basal tarsal joint on the middle and hindlegs, but conform rather to the type of *Pseudocloeon* in this respect. She also wondered if *C. consignatus and C.* sp. represented still another genus and what the status of *portoricensis* might be.

Through the kindness of Dr. Henry Dietrich of Cornell University, I have dissected and mounted a paratype of *C. portoricensis* and Puerto Rican nymphs collected by Dr. Needham that are identical with those that reared the holotype of this species. The adults of *C. portoricensis* can be separated from those of *C. maculipse* through the proportions of the middle and hindleg tarsal segments; the nymphs of the two species have labial palpi that are completely different in form of the apical segment, and also differ in the number of segments making up these palpi. The maxillary palpi of *C. portoricensis* bear numerous fine hairs or spines while those of *C. maculipes* have none. The nymphal claws of *C. maculipes* are without denticles while those of *C. portoricensis,* described as being without denticles, actually bear 18-20 very fine spines on the basal halves.

The very long first tarsal segment in the middle and hind leg of the type species of *Cloeodes* is the single means by which this genus can be separated from *Pseudocloeon* in the adults, yet this feature does not exist in *C. portoricensis* so that the latter cannot be distinguished from *Pseudocloeon.* The labial palp of the type species of *Cloeodes* is quite similar in form to that of *Pseudocloeon* and that of *C. portoricensis* is entirely different from any dipterous member of the Baetinae. The degree of these nymphal differences indicates a considerable genetic separation and, from the taxonomist's standpoint, only a portion of the genus *Cloeodes* can be keyed to make a separation from *Pseudocloeon* in the adult stage.

Dr. Traver suspected at the time of making the original description, that *Cloeodes portoricensis* should not be considered as belonging to the same genus as *C. maculipes.* It is my conclusion that this is true.

In August of 1954, my wife and I collected on the lower Tuolumne River, nymphs that appear to be identical with the nymphs of *C. portoricensis;* a number of these nymphs were reared and the reared adults show only specific differences from the adults of *C. portoricensis,* these differences being in maculation and form of the penes cover.

On the above basis, I propose the new genus *Paracloeodes,* this genus to presently include the type species, *P. abditus* Day from California and the Puerto Rican species *P. portoricensis* Traver, the latter transferred from *Cloeodes.* Inasmuch as the

adults of *Paracloeodes* cannot be separated from those of *Pseudocloeon*, the nymph of the type species is selected as the holotype.

Remarks on the condition of the lower Tuolumne River will be made in the discussion of the new genus *Apobaetis*, to be described in this paper. Nymphs of *Paracloeodes abditus* were collected on August 7th, 1954 in water of 82° F. and, despite careful search prior to this time, no specimens were taken until this date, when the nymphs were found to be almost or entirely mature. It is probable that the nymphs remain in the deeper and cooler portions of the river until approaching maturity brings them into the depths of four to six inches near the streamside where they were taken. The nymphs are highly selective in their habitat, being found in only a few widely scattered locations in good current and resting on very fine sand.

In the aquarium, emergence of the nymph occurs from about 8:00 to 9:00 P.M., the subimaginal skin is shed during the night, and the mature imago is found alive at dawn. One hour after emergence in the darkened room of the aquarium, a strong light produced no effect on the movements of the subimagos.

Apobaetis Day, new genus

Adult: Very small, male with body 4.0, forewing 4.0, foreleg 4.0 and tails (2) 6.25 mm. long. Female with body 4.75, forewing 4.5, foreleg 2.25 and tails (2) 6.00 mm. long. Hindwings absent. Eyes of male very large, especially long and narrow, 60% longer than wide; contiguous at bases in posterior portions, widely separated in anterior portions; .3 mm. in height when measured up the outer side. Eyes of female one-fourth further apart than their longest axis. Posterior margin of female head slightly produced. Foreleg of male with tibia 1.5 length of femur and tarsus 1.3 length of femur; proportionate lengths of tarsal segments 1 to 5 respectively 1, 14, 10, 6 and 4. Hindleg of male with femur and tibia subequal and tarsus one-half this length; proportionate lengths of tarsal segments 1 to 4 being respectively 4, 3, 2 and 3. Tibio-tarsal joints of male and female entirely fused. All leg segments beset with fine spinules, not to be seen under magnifications of 250–300 ×. Venation of forewing as in figure 18; marginal intercalaries paired. Apical margin of sternite 9 of the female very slightly produced. First segment of male penes large, second and third fused. In the type species, a prominent penes cover as in figure 13.

Nymph: Length of body of male about 4.0, legs 2.0, and tails (3) 1.6 mm. Length of antennae 1.75 length of head. Antero-lateral portions of head deeply cut away, exposing mouthparts; posterior margin straight. Mandibles with canines notably long, sharp-pointed, strongly divided to base into two groups; an extremely large tooth situated above molars on left mandible as in figure 4; area between canines and molars bare; prostheca heavy, divided

at tips and symmetrical. Labrum with straight, unmodified anterior margin as in figure 2, this condition being unique in the entire subfamily Baetinae. Maxillary with body of galea-lacinia unusually light, narrow and graceful; palpi definitely three-jointed, one-half their length extending beyond the tip of the galea-lacinia as shown in figure 5. Labial palpi two-jointed and as shown in figure 6 with distal margin squarely truncate and set with stiff, fine spines; a sharp and deep "V"-shaped slot on inner apical margin. Pronotum three and one-half times as wide as long; posterior margin excavated. Anterior margin of first tergite slotted on anterior margin to receive scutellum of metanotum. Margins of abdominal segments expanded into flat lateral extensions of moderate width. Legs as in figure 27. Tibia and tarsus of equal length, about half that of femur. Claws of all legs very long and fine, fully as long as tarsi, almost straight and without denticles. Gills ovate and single, hyaline white, tracheae dark gray. Three tails of equal diameter, the center tail often as long as laterals; heavily margined with fine hairs of medium length on each side of middle tail and inner sides of laterals.

Type of the genus, *Apobaetis indeprensus Day*, new species

Apobaetis indeprensus Day, new species

(Figures 1–6 and 13–18)

The morphological details of this species, the type species of the new genus *Apobaetis,* have been give above Features that might be expected to be of a specific nature are as follows:

Male adult: Front, vertex and genae of the head palest brown strongly marked with fuscous. A wide band of fuscous rings the white pit of antennal sclerite. Ocelli set on rather high, fuscous stalks; a band of fuscous between lateral ocelli and a pair of long, ovate fuscous spots on vertex. Scape, pedicle and basal portion of filaments of antennae washed with fuscous. Eyes ringed with narrow stripe of fuscous basally; a short, fuscous stripe half-way up anterior face of each stalk; lower halves of stalk washed with brown. Pronotum dark brown, posterior margin widely pale. Scutum dark brown, sutures black; a small white area on median anterior margin; antecosta fuscous, prescutum white. Scutellum and post-scutellum dark brown with postero-lateral margins pale. A large white area mesad of the scutellum with a pair of small black oval rings in posterior portion. Metanotum dark brown outlined in black, with median and pair of small, pale submedian spots on scutellum. Pleural sclerites small and dark brown, membranous areas white and very wide. Sclerites of venter dark brown, widely outlined in white; fuscisternum and post-fuscisternum entirely white. Trochanter of each leg set in large white area. Abdominal segments 2-6 hyaline white; 1 and 7-10 pale brown. Wings hyaline, veins white; a prominent large brown spot at base. Legs, tails and forceps milky white, translucent. *Female:* Brownish markings much lighter in color, similar in maculation.

Male nymph: Length of body 4.0, legs 2.0, tails (3) 1.6 mm. The morphological features of the holotype nymph have been given in the generic description. The nymph of *Apobaetis indeprensus* is dirty whitish in color, touched with but limited areas of dark brown. Entire head white except lateral margins of the labrum which are finely black. Upper portion of develop-

ing adults eyes clearly seen in mature nymph as pale yellow with circles of gray on perimeters. Pronotum white with submedian dark dots near median of anterior margin; short dark stripes on antero-lateral margins; a dark triangular spot in postero-lateral corners. Mesonotum white with dark brown areas in antero-lateral portions; faint brown stripes along anterior margin except in median portion, and on postero-lateral margins. Margins of metanotum widely darkened. A prominent dark brown area above middle and hind trochanters. Venter white. Tergites 1, 4, 5, 7, and 8 white; 2, 3 and 6 washed with dark brown; 9 and 10 palest brown. Tergites 1-4 with fine dark margins along median portion of anterior margins. Fine, dark spinules along all posterior margins. Anterior margin of tergite 1 rather widely and lightly darkened, clearly delineating the wide and deep median slot in this margin. Tergite 2 darkened in median portion; a rounded, large white spot at median on anterior margin, with strong semi-circle of dark smoky around this pale spot; a very dark median stripe extends caudad from dark semi-circle along median line almost to posterior margin. Tergite 3 darkened in median area with darker wide, short submedian stripes on anterior margin. Tergites 4 and 5, 8 and 9 with short dark submedian dashes from anterior margins, and small dark spots laterad of the stripes and on anterior margins, Tergite 6 dark with large very dark spot at median near anterior margin. Pleural fold hyaline white, the spiracle of each segment marked with a large, prominent dark spot. Sternites white, anterior margins of 8 and 9 widely and slightly darkened. Legs white, each femur with tiny dark spot on anterior surface two-thirds distant from base. Claws very long, nearly straight and without denticles. Three white tails of equal length, strongly banded with brown from base to tip on notal surfaces only; in each four tail joints, three contiguous joints are dark marked and the fourth is white.

Holotype: Male nymph, mature; collected by Helen L. Day and W. C. Day on the Tuolumne River, Stanislaus County, California, about six miles east of Modesto, August 14, 1954; in collection of California Academy of Sciences. Topotypical paratype nymphs, together with male and female adults reared from same to California Academy of Sciences, Canadian National Collection, Cornell University and G. F. Edmunds, Jr. Thirty-five topotypical nymphs, fifteen males, fifteen females, forty nymphal cases and numerous slides, in author's collection.

The writer is aware of the taxonomic difficulties occasioned by establishing new genera of Baetinae based on the nymphal forms of the type species, yet there appears to be no practical alternate in properly placing the nymphs of *Apobaetis* and *Paracloeodes*, and I believe it to be of value to make them known to other workers. In the subfamily Baetinae, the specializations and simplifications of the adults are marked by such distinct features as loss of hindwings, loss of wing veins and basal attachments, and loss of

external penes in the male. Absence of such important taxonomic characters might well be expected to make the separation of the adult components of the subfamily more difficult. Baetine nymphs show such simplifications as fusion of the canines and/or labial palpi, two-jointed condition of the maxillary palpi, and total loss or reduced length of the center tail, these simplifications appearing in different combinations in some, but not all genera.

Because of the loss of certain adult characters, it seems to the writer that consideration of the total aggregate of adult and nymphal characters is more than ordinarily necessary in classification of the Baetinae. The work of Traver (1937:75) points up a similar conclusion though based perhaps on other factors. She states that further study of the specialized Baetine group, Neotropical and Palearctic as well as Nearctic, has convinced her that many genera are involved, and that it may not be possible in all cases to be certain of the genus unless both the nymphs and imagos are known.

Edmunds and Travers (1954:236) in their recent reclassification of the Ephemeroptera list thirteen valid genera of the subfamily Baetinae, show that seven generic synonymies had been made through 1953, and effected one new synonym. In addition to these, Dr. Edmunds has indicated to me that, in his opinion, three further synonymies are probable in this subfamily. Without the latter three, twenty-one named genera have been reduced by over one-third, which would indicate considerable taxonomic insecurity during the history of the subfamily.

By 1933, Herman T. Spieth had reached the conclusion that neither the genus *Acentrella* nor *Heterocloeon* were good genera but should be treated as elements of the genus *Baetis*, and this is where they are now placed in the 1954 reclassification by Edmunds and Traver. Dr. Spieth (1933:338-339) comments on the genus *Pseudocloeon* may well foreshadow further changes in the generic classification of the Baetinae, and emphasizes the importance of nymphal characters in the classification of the genera of the Baetinae. He remarked that the genus *Pseudocloeon* is like *Baetis* in every item of nymphal and adult structure that he considered, except that the adult lacks hind wings and the nymph has only two caudal setae.

Dr. Spieth's pertinent comments are as follows: "Considering wing characters alone, a graded series can be found which extends from the condition found in *Baetis parvus* to that found in *Pseudo-*

cloeon . . . It is possible that even *Pseudocloeon* should be considsidered part of the genus *Baetis*, comparable with the short winged forms known among *Drosophila*, leaf hoppers, beetles, parasitic hymenoptera, gall wasps, etc. (See Kinsey, 1930). Each of the types of reduced wings in these mayfly groups may have arisen by direct and independent mutation from a form such as *B. parvus*. It is not necessary that there has been a gradual descrease in the size of the hind wing. The *pseudocloeon* species *may* be more closely related to a species of *Baetis* than are two species which are now unquestionably regarded as members of that genus. A thorough and careful working of the whole group with large series from wide localities, plus the correct association of the nymphs with the adults, may throw some light upon the question of relationships and the relative positions of the various species in the evolutionary scheme. Until that time it is necessary to admit that our classification may be and probably is an artificial one, and that it cannot be said with certainty that it represents a picture of the phylogenetic history of the group."

Consideration of the similarity of the morphological details of the nymphs could have played an important part in the synonymy of *Heterocloeon* with *Baetis* by Edmunds and Traver (1954). While the hindwings of the former have not actually disappeared, they are so greatly reduced in size as to appear as tiny threads. It would seem to the writer that *Heterocloeon* could have as logically been included in *Pseudocloeon* as in *Baetis*. In either case, the nymphal evidence of close similarity offsets the difference of the development of the adult hindwings.

In *Apobaetis* and *Paracloeodes* we encounter a reversal of the above situation in that the adult similarities to known genera are not followed by nymphal similarities but by considerable differences; the similarities of the adult are, in fact, denied by the nymphal form. Both adult and nymph of *Paracloeodes* can be separated from the type species of *Cloeodes* but, while the differences of the nymphs are great, I have been unable to find morphological features that will separate the male adults of *Paracloeodes* from *Pseudocloeon*. The most important differences between the nymphs of *Paracloeodes* and *Pseudocloeon* are seen in the number of tails of the nymph, three, not two; relative length of claw to tarsus, 60%, not 35%; type of denticles of the claw, 18-20 fine and hairlike, not 7-8 long and heavy; form of the canines, fine and entirely separ-

ated into two groups, not heavy, blunt and fused into a single mass; prostheca, fine and hair-like, not wide and heavy; shape of galea-lacinia, light and graceful, not heavy, wide and blunt; and the form of the distal segment of the labial palpi, deeply divided into a sharp outer point and rounded inner lobe, not simply rounded.

The male adult of *Apobaetis* cannot be separated from either *Paracloeodes* or *Pseudocloeon*, but the nymph has little morphological resemblance to either. In *Apobaetis* the straight anterior margin of the labrum, with no slightest indication of a median notch, is unique among all genera of the Baetinae. The form of the canines, long and toothless claws, as well as the segments of the maxillary palpi are more like those of the nymphs of *Centroptilum* than any other of the Baetinae.

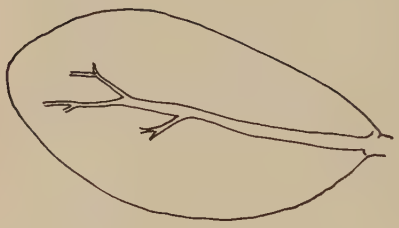
A chart of the Baetine nymphs (except *Baetiella* which is here regarded as *Pseudocloeon*) that have dipterous male adults with paired intercalaries of the forewing appears as follows:

Nymphs of two-winged mayflies with paired intercalaries of forewing

	tails	claws lgt*	claws denticles	canines	max. palp joints	labial palp joints	labial palp form †
Pseudocloeon	2	1/3	7-8 heavy, long	fused, blunt	2	3 semi-fused	rounded
Cloeodes	3	1/3	none	fused, blunt	2	3	rounded
Paracloeodes	3	6/10	18-20 hair-fine	separated fine, rounded	2	2	divided, point and lobe
Apobaetis ‡	3	equal	none	separated fine, pointed	3	2	square, notched

* relative length, claw to tarsus
† form of distal margin, apical segment
‡ no median notch, anterior margin of labrum

I have no hesitancy in proposing the new genus *Apobaetis* on the single species *A. indeprensus* as it would seem most likely that further collecting with the requisite equipment should yield additional species. We now have *Paracloeodes* from California and Puerto Rico and Traver's *Baetine* No. 1 fram California and Brazil, and it seems reasonable to assume that these forms are to be found somewhere in between these distant points. However, if only the



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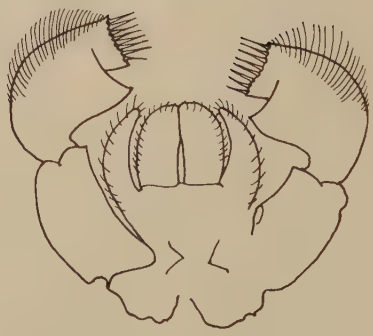

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PLATE I

Figures 1-6, *Apobaetis indeprensus*, paratype nymph. Fig. 1, Third gill. Fig. 2, Labrum. Fig. 3, Right mandible. Fig. 4, Left mandible. Fig. 5, Right maxilla. Fig. 6, Labium.

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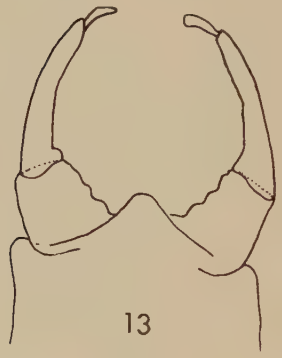
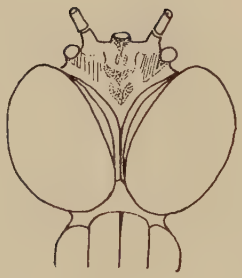
PLATE II

Figures 7-12, *Paracloeodes abditus*, paratype nymph. Fig. 7, Labrum. Fig. 8, Third gill. Fig. 9, Right manible. Fig. 10, Left manible. Fig. 11, Left maxilla. Fig. 12, Labium.





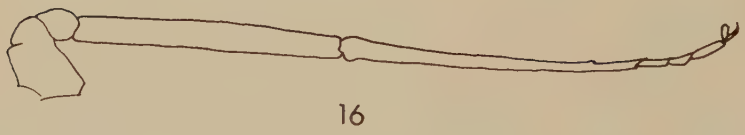
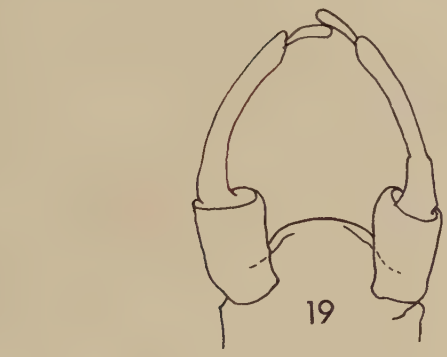
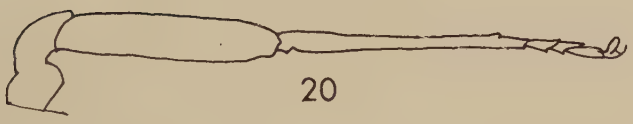
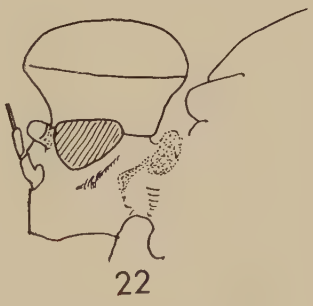


PLATE III

Figures 13-18, *Apobaetis indeprensus*, adult. Fig. 13, Male genitalia, ventral aspect. Fig. 14, Male head, dorsal aspect. Fig. 15, Male head, lateral aspect. Fig. 16, Male hindleg. Fig. 17, Female head, dorsal aspect. Fig. 18, Male wing.







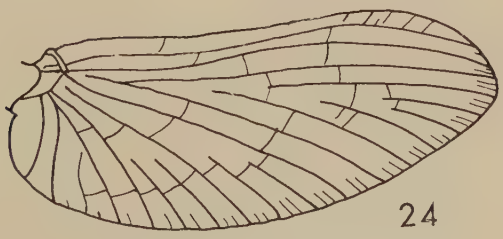


PLATE IV

Figures 19-24, *Paracloeodes abditus*, adult. Fig. 19, Male genitalia, ventral aspect. Fig. 20, Male hindleg. Fig. 21, Male head, dorsal aspect. Fig. 22, Male head, lateral aspect. Fig. 23, Female head, dorsal aspect. Fig. 24, Male wing.

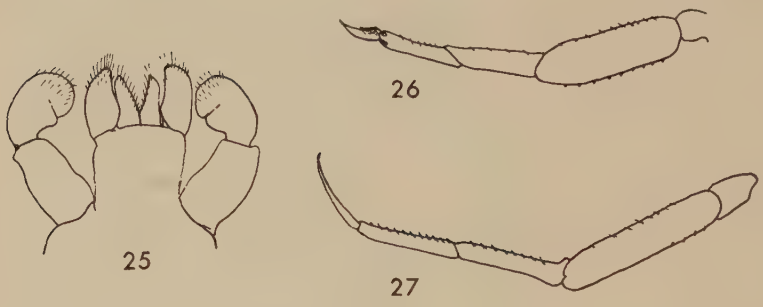


PLATE V

Fig. 25, Nymphal labium, *Pseudocloeon carolina.* Fig. 26, Nymphal foreleg, *Paracloeodus abditus.* Fig. 27, Nymphal foreleg, *Apobaetis indeprensus.*

adults of *Apobaetis* or *Paracloeodes* were taken, they would unundoubtedly be labeled as *Pseudocloeon;* if only the adults of *Baetine* No. 1 were taken, they would be classified as an ordinary species of *Baetis.* It is quite possible that nymphs of *Apobaetis* and *Paracloeodes* have not been previously collected because the ordinary equipment used for taking nymphs is unsuitable for collecting these tiny specimens.

The nymphs of *Apobaetis* and *Paracloeodes* are small and elusive as well as pale and most difficult to find on the collecting screen. To take these nymphs we found it necessary to employ a 26 mesh screen of small enough area that the whole screen could be partly immersed in a large white enameled pan half-filled with water. Here the nymphs can be located only by their movements.

The nymphs of *Paracloeodes abditus* and *Apobaetis indeprensus* are warm water species showing remarkable ability to survive under highly marginal conditions. The lower Tuolumne River has been dredged, diverted and dammed, and has suffered pollution from irrigation run-off, crop-dusting, sewage and industry. In early June of 1954 water temperatures had risen to 75° F, in July 80° F., and in August 82° F.; very few mayfly genera were encountered apart from the Baetinae, and representatives of these were found in very small numbers.

Less damaged streams of similar origin and type of location in California are rich in mayfly species and other aquatic fauna. From all indications the lower Tualumne River was at one time heavily populated with a wide diversity of mayfly species, and the remaining Baetinae represent the forms whose specializations have

been successful in permitting continued existence in the adverse situation now encountered.

Apobaetis nymphs, like those of *Paracloeodes*, were found in small groups over widely scattered areas, the former at depths of 18-24 inches in rather fast runs of water over fine sand, and the latter in much more shallow water.

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NEW LOCALITY RECORDS AND A NEW HOST RECORD FOR HAEMATOSIPHON INODORUS

(Hempiptera: Cimicidae)

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Haematosiphon inodorus (Duges) has been taken from several localities in the southwestern United States and from Mexico. Collections of this species have been reported from Guanajuato, Mexico (Duges, 1892); western Texas and Las Cruces, New Mexico (Townsend, 1893); Aguas Calientes, Mexico (Horvath, 1912); San Juan de Guadalupe, Mexico (Mazzotti, 1941); Mexico City, Mexico (Andrade, 1946); Ventura County, California, 25 miles S. E. of Bakersfield, California; Corona, California, and Freedom, Oklahoma (Usinger, 1947); and Norco, California (Lee, MS). Blatchley (1928) reported that this species was taken from Lakeland, Florida, and Tavares, Lake County, Florida. There is some question as to the correct identification of these specimens, however, because *Haematosiphon* has not been reported from Florida since 1928 while *Cimexopsis* and *Ornithocoris*, closely related genera, have been taken there. Blatchley also mentioned

that G. M. List had records of *H. inodorus* from central Kansas.

Dr. H. E. Kemper, Inspector in Charge, Zoological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. D. A., Albuquerque, New Mexico, kindly sent the writer specimens of *H. inodorus* collected by Dr. Kemper and his associates from localities not reported before. The data for these collections are as follows: Belen, New Mexico, by Dr. I. H. Roberts and Dr. H. O. Peterson on May 30, 1947; Las Lunas, New Mexico, by Dr. Peterson in May, 1947; and Albuquerque, New Mexico, in June, 1945, and on April 23, 1947, by Dr. Kemper.

The collection made by Dr. Kemper in June, 1945, was taken from a turkey on a turkey farm. Although a number of collections have been made from chickens, this was the first time a turkey has been reported as the host.

Dr. J. N. Roney, Extension Entomologist of the University of Arizona, kindly supplied the writer with collection data of *H. inodorus* from Arizona. Collections were made by Roney in Navajo County from two chicken yards and three homes in July, 1946. Dr. Roney stated *(in litt.)* that *H. inodorus* has been reported from the Holbrook area, Navajo County, during the months of June, July or August of the years 1947 to 1950. He further reports that bugs of this species were taken at Duncan in Greenlee County in July, 1951, and from Safford, Greenlee County, in August, 1951.

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FROSTED SCALE ON WALNUTS IN NORTHERN CALIFORNIA

(Hemiptera: Homoptera)

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The frosted scale, *Lecanium pruinosum* Coquillett, occurs in most of the walnut orchards in Northern California. Before the advent of DDT, it seldom increased to alarming numbers. Michelbacher, *et al* (1946), observed that the population of the frosted scale increased following applications of DDT used to control the codling moth on walnuts. Middlekauff, *et al* (1947), noted the same situation, and further called attention to the fact that higher dosages of DDT favored an increase in the population more than did lower ones. Later Michelbacher and Middlekauff (1949) reported that present evidence indicated that the danger of the frosted scale population increasing to a dangerous level can be greatly reduced by using not more than 0.5 pound of actual DDT to the 100 gallons of spray. Later Michelbacher and Bacon (1952) stated that the danger of serious increases in the frosted scale population has been fairly well eliminated by reducing the concentration of the DDT in the spray to the lowest level that will insure effective control of the codling moth.

Bartlett and Ortega (1952) conducted a critical study of the natural enemy association connected with DDT-induced increases in the frosted scale in Southern California. They found that the increase was due to the direct effect of DDT residues upon the single parasite species, *Metaphycus californicus* (Howard) which is the dominant parasite of the frosted scale on walnuts in that area. They also noted that there was considerable evidence that the increase in the frosted scale population, to a certain extent, was a cyclic event not necessarily connected with direct application of DDT. They reached this conclusion because it had shown some increase over previous numbers in districts where lead arsenate programs had been adhered to.

Ortega (1953) stated that the encyrtid parasite, *Metaphycus californicus* (Howard) is very effective in keeping the frosted scale

[1] For field and laboratory assistance, thanks are due to John E. Swift, Earl Oatman, Clarence S. Davis of the University of California, and to Ross R. Sanborn, Farm Advisor, Butte County, California.

under control, but that certain necessary pest control practices, together with other factors, may inhibit the work of this parasite. In cases of severe outbreaks, he recommended dormant treatments directed against the immature scales. He stated that effective control could be obtained with parathion wettable powder at the rate of 5 pounds per acre or with a DDT (50% wettable powder, 10 pounds per acre) plus kerosene (10 gallons per acre) spray. The amounts given above should be applied in 250 gallons of water per acre when a Speed Sprayer is used or in 500 gallons of water when applied with conventional sprayers.

A knowledge of the general life history of the frosted scale and its parasites is helpful in explaining how applications of DDT influence the scale population. The frosted scale passes through a single generation each year, while the important parasite attacking it has several. This allows for a rather rapid increase in the parasite population, and its repeated opportunity to parasitize the scale favors excellent biological control.

Eggs of the scale hatch during late May, through June and into July. The crawlers settle on the leaves, current season's and adjacent growth. Development is slow and the elongate scale remains extremely small throughout the summer, fall and into the winter. Beginning in late winter, growth starts and is rapid through early spring. During the period of rapid growth the scales become covered with a powdery white wax and quantities of honeydew are secreted. Eggs are produced during April and May and as energy is expended in egg production less and less honeydew is secreted. The mature scales are large, brown, convex, somewhat oval and measure about 5 to 7 mm. in length. An enormous number of eggs are laid which occupy practically the entire space beneath the scale. With egg production completed, the scale dies, and the waxy covering weathers away.

There are several parasites which attack the frosted scales. Many were reared and these were submitted to P. H. Timberlake of the University of California Citrus Experiment Station at Riverside, California, for determination. The most abundant species was *Metaphycus californicus* (Howard). Two others were also present, *Encyrtus californicus* (Girault) and *Coccophagus lycimnia* (Walker). Besides these, there was a secondary parasite, *Pachyneuron* sp.

Observations have indicated that unless some interfering factor

is involved, the frosted scale is likely to be held below an economic level by natural enemies. Even where conditions have given rise to a destructive population, parasites will bring the infestation under control if practices which adversely effect the parasites are not continued. A season is usually necessary for the parasites to reduce a destructive scale population to a low level.

An increase in the scale population is likely to follow any practice that more adversely effects the parasites than it does the frosted scale. While many factors, both due to the activity of man and nature, influence the frosted scale population, the ones that are associated with applications of DDT are probably the easiest to explain.

Since shortly after DDT was first used on walnuts to control the codling moth, it was observed that serious increase in the frosted scale population usually occurred following the application of high dosages of DDT. However, where low dosages were applied, little trouble from the scale was experienced. Investigations have shown that where 4 pounds of actual DDT are applied per acre, adequate control of the codling moth can be obtained without resulting in a serious infestation of the frosted scale. Over much of Northern California, the codling moth spray, depending upon the season and locality, is usally applied sometime between the end of April and May 20. The frosted scale at this time has reached maturity and is full of eggs. Also, the majority of the parasites are completing their development within the body of the scales. Most of the parasites are in the later larval or pupal stage. They are, however, protected by the scale from contact with the spray. Apparently then when low dosages of DDT are used, the residual action of the spray residue in so far as the parasites are concerned has lost most of its toxicity by the time that the parasites emerge from their hosts. On the other hand, where high dosages are applied, the spray residue is highly toxic to the parasites at the time they emerge.

Although other treatments directed against walnut insects influence the scale population, it is believed that the greatest impact is from the May codling moth spray. Sometimes a second DDT spray is applied to control the second brood of codling moth. This treatment is usually applied about June 20. At this time eggs of the frosted scale have hatched and observations indicate that the DDT spray is toxic to the young scale. At least, Middlekauff and

Michelbacher (1947) found that the frosted scale population was smaller where two, rather than one, applications of DDT were used to control the two broods of codling moth. In order to control the walnut aphid, *Chromaphis juglandicola* (Kaltenbach), an aphicide always should be incorporated with a codling moth spray that contains DDT. This procedure is advisable because a serious increase in the aphid population usually follows DDT treatments in which an aphicide has not been incorporated. All the aphicides, such as nicotine and parathion, that are used in the walnut insect control program are at least partially effective against young frosted scales when they are thoroughly and evenly applied. Therefore, the incorporation of aphicides where a second codling moth spray is applied tends to mask the effect of DDT.

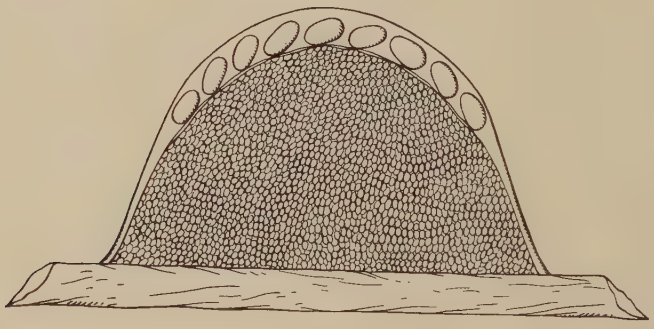
Walnut aphid control is practiced in many orchards repardless of whether or not DDT has been uses for the control of the codling moth. Usually from 2 to 5 treatments are necessary to satisfactorily control the pest for the entire season. Where thoroughly applied with adequate equipment, these treatments also result in the elimination of most of the young frosted scales. The sprays must also directly effect the parasites of the scale, but the action upon the parasites apparently does not result in the development of destructive scale populations where the treatments have all but eliminated the young scales. However, this does not always happen, and it can be assumed that if the action of the aphicide more adversely effects the parasites than it does the frosted scale, then there is a possibility for the development of a serious pest population. There are a number of complex factors involved, and this phase of the problem is in need of further investigation.

A rather large frosted scale population was present in one experimental orchard where demeton, O, O-diethyl-O-2-(ethylmercapto)-ethyl thiophosphate, was applied on May 15, 1953, at the rate of one pound actual ingredient per acre to control the walnut aphid. The scale crawlers on hatching were able to settle down successfully in large numbers on the walnut leaves, but those that settled on the twig growth were apparently all killed. Many twigs were examined that were literally covered with dead scales. However, in the fall before the leaves dropped, many of the scales on the leaves crawled to the twigs. These would have resulted in a rather troublesome infestation, if it were not for the fact that many of them were parasitized. The degree of parasitism as

determined by a survey conducted on April 13, 1954 amounted to 79.4 per cent.

Serious infestations of the frosted scale usually develop the season preceding the time that they come to the attention of the grower. The very small scales go unnoticed during the summer, fall and winter. It is not until they begin to develop rapidly in late winter and early spring that the farmer becomes alarmed. Usually by this time, even in the case of heavy infestations, parasites are increasing at a rate that indicates that they will bring the pest under control during the coming season. The parasites had been breeding and increasing in numbers on the young scales during the preceding summer and fall. During the dormant season, their development comes to a standstill, but in late winter and early spring, it commences again. They complete their development and upon emergence attack frosted scales which previously had escaped parasitism. Up to the time of rapid growth of the host, a scale furnishes only enough food for a single parasite. A scale parasitized during this period (summer, fall, late winter) appears somewhat mummified, and is characteristically humped, which serves at a glance to distinguish it from the flattened normal non-parasitized individuals. However, when the host begins to develop rapidly, more than a single parasite may develop in it. From all outward appearance, parasitism does not seem to interfere with normal development. Eggs are produced in quantity, and there are no easily detectable external signs of parasitism. If on reaching maturity, a parasitized scale is turned over, eggs pour out in enormous numbers. In spite of the large number of eggs produced, an individual scale may contain upward to 10 or more parasites. The energy of the scales is effectively used to produce eggs while their bodies are being consumed by the parasites. A parasitized scale could easily escape detection, for with the eggs removed, the scale appears to be empty. It might be compared to a helmet with an inner lining. The situation that exists at this time is illustrated in figure 1. Figure 1A is a diagrammatic sketch of a parasitized scale on a twig, showing how the entire space beneath the scale is filled with an extremely large number of eggs. Above this mass of eggs is the thin, dried, almost parchment-like skin of the scale, and between the skin and the outer wall of the scale are numerous parasites. Figure 1B is a photograph of a scale with the eggs removed, and Figure 1C shows the dry skin broken away, revealing

the developing parasites. A grower who is unaware that the scales are parasitized believes that the orchard is surely going to be seriously infested. However, in most cases there is a large enough developing parasite population to check the infestation (fig. 2). In some orchards the amount of parasitism of mature scales approaches 100 percent. An actual count on May 25, 1953, in one heavily infested orchard showed that out of 200 scales dissected and examined under a binocular stereoscopic microscope. 170 or



A

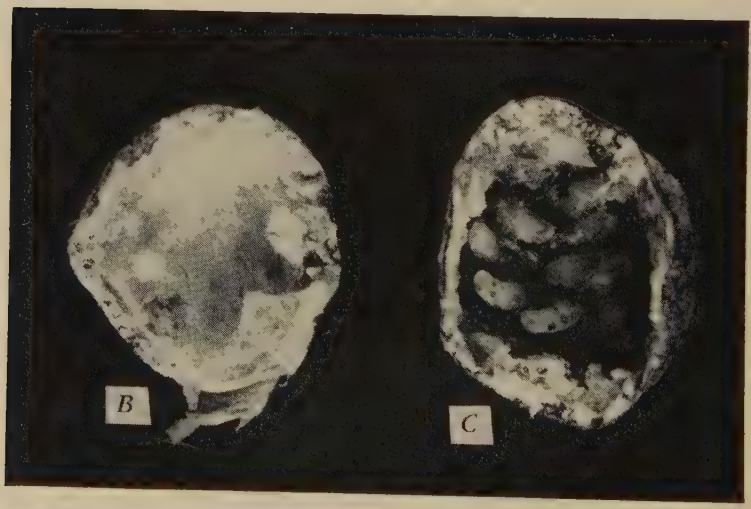


Fig. 1.—(A) Diagrammatic cross-section of a parasitized scale on a twig showing entire space beneath the scale filled with minute eggs, and larger developing parasites in dissipated body of scale. (B) Ventral view of scale as in "A" with eggs removed. (C) Same as "B" with dry skin broken away revealing the developing parasites (X8).

85 percent were parasitized. A second survey in the same orchard was made on June 19, 1953, and this time 91 percent of the scales were parasitized. In another heavily infested orchard which was examined on the same date, 87 percent of the scales were parasitized. By the middle of June, most of the parasites had pupated and a few had emerged. Adult parasites had been observed to issue from the host as early as May 25. Adult parasites eat small holes in the top of the scale through which they emerge. The emergence of

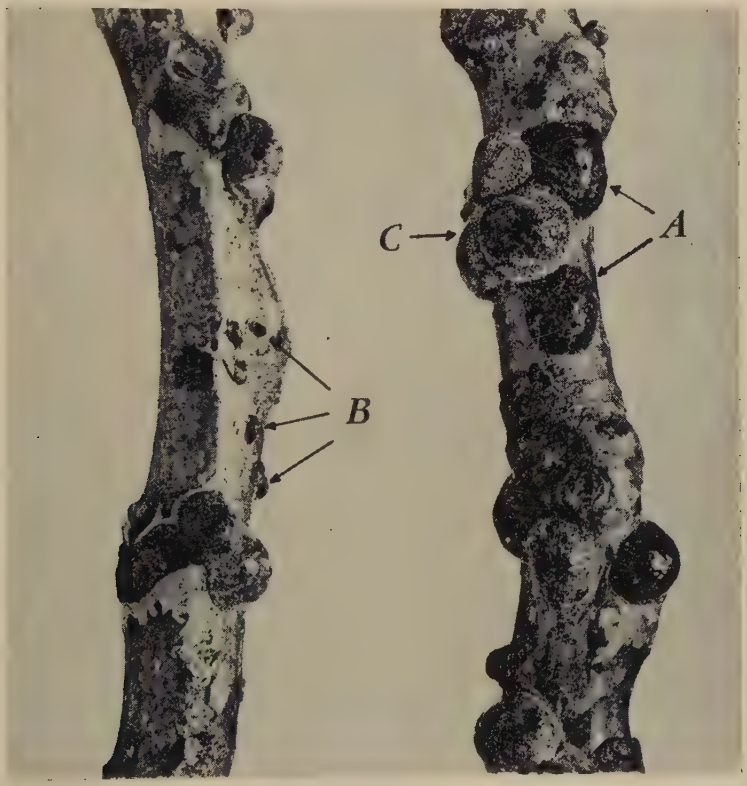


Fig. 2—Condition of a severe frosted infestation on walnut, May 3, 1953, that is about to be reduced to a non-destructive level by natural enemies. (A) Scales which were parasitized by *Metaphycus californicus* (Howard) in late winter and early spring of 1952 and from which the parasites emerged in June of 1952. (B) Mummified bodies of scales which were parasitized in the fall of 1952 and from which the parasites have emerged. (C) Scales which escaped parasitism until at least late winter and spring of 1953. Of these, about 90 percent are parasitized and represent a condition as shown in Figure 1 (X3).

the parasites is timed rather closely with the hatching and settling down of the scale crowlers. It is also seen that the emergence of most of the parasites occurs some weeks after the codling moth spray is applied.

DDT applied at other times than in the May codling moth spray can interfere seriously with parasitism. On March 22, 1953, a grower sprayed an orchard heavily infested with the frosted scale with a mixture of 2 pounds of DDT and 1 gallon of light summer oil to 100 gallons of water to control it. Where the coverage was good, a fair kill of the scale was obtained. However, the DDT residue played havoc with the emerging parasites. This was evident for on May 25 a survey of the mature scales showed only 3 percent of them to be parasitized.

On a number of occasions, serious infestation of the frosted scale were called to the attention of the writer. Without exception, the growers had not become alarmed until the scales started rapid development in late winter and early spring. Further, in nearly every case, the maturing scales were heavily parasitized, indicating that natural enemies were rapidly gaining the upper hand.

All the evidence so far obtained seems to show that most of the serious increases in the frosted scale population in one way or another are associated with the use of the newer insecticides. The danger of destructive populations developing can be avoided to a large extent if the insecticides used in the walnut insect control program are applied with caution. Where applications are necessary, they should be applied with effective equipment that insures thorough coverage. Even where the best of control programs are followed, the general level of the frosted scale population may be higher than it was before the advent of the newer insecticides. This cannot be determined for a certainty because of the lack of accurate population studies before the new insecticides came into general use.

It is known that the frosted scale can be controlled with dormant oil sprays. However, sprays of this nature can cause injury to walnuts and should never be applied except in the full dormant season. One orchard was examined where the trees had been thoroughly sprayed on April 4, 1953, with a spray containing 3 gallons of dormant oil emulsion to the 100 gallons of water. A 99 percent kill of the scales was obtained, as determined by a survey made on April 8. In this orchard, another survey was conducted on May 25.

The average number of live scales (including those that were parasitized) were counted on a 2.25 inch area of twigs collected at random. The average per twig for the unsprayed portion of the orchard was 5.54, while that for the sprayed area was 0.16. Parasitized scales were encountered in the treated as well as the untreated portion of the orchard. Also, the sprayed area showed some oil injury, and the growth was noticeably retarded as compared to the unsprayed trees. The spray, however, was applied later than in the full dormant season.

SUMMARY

Before the advent of the newer insecticides, the frosted scale was seldom a problem in walnut orchards. The pest is attacked by a number of parasites, of which the most abundant and important is *Metaphycus californicus*. The parasites if not adversely effected in one way or another tend to hold the frosted scale population to a non-economic level. Effective natural control is favored by the fact that the frosted scale has but a single generation a year, while the important parasite has several.

Where high dosages of DDT are used to control the codling moth, serious infestations of the frosted scale frequently develop. Investigations have shown that destructive populations are not likely to occur where DDT is used at a rate not to exceed 4 pounds of actual per acre. This quantity is sufficient to give adequate controly of the codling moth where the application is timely and it is thoroughly applied. The codling moth spray, depending upon the season and locality, is usually applied between the end of April and May 20. At this time, most of the parasites are developing within the scales and thus are protected from direct contact with the spray by the shell of the scale. Emergence of the parasites in large numbers does not occur until after the middle of June. It is believed that where low dosages of DDT are used that the toxicity of the spray residue in so far as the parasite is concerned has mainly disappeared, but where high dosages of DDT have been applied, the residue is still highly toxic to the parasites at the time they emerge. Where serious infestations of the frosted scale have developed, parasites will in time reduce it to a non-destructive level if the practices unfavorable to the parasites are discontinued. Usually it takes about a season for the natural enemies to do this.

Other treatments besides the codling moth spray, such as those

directed against the walnut aphid, influence the frosted scale population. Their effects are not as easy to ascertain as are those resulting from the use of DDT. However, it appears that if they are more adverse to the parasites than they are to the scale, the development of serious infestations of the scale are favored.

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A NEW SPECIES OF SCHIZILLUS

(Coleoptera:Tenebrionidae)

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Schizillus beali Parker, new species

Form oblong-oval; color dull black, opaque; integument variously punctate, most of the punctures bearing very fine, short pale hairs.

Front with broad, shallow, transverse impression; epistoma broadly convex and prominent medially; fronto-epistomal margin hemi-hexagonal; surface smooth, finely, sparsely punctate in apical half, more densely and coarsely along median margin of epistoma. Antennae slender, shining, dark reddish-brown, sparsely punctate, with short pubescence throughout, mixed with long fine pale hairs on segments 5 to 11. Third antennal segment not quite as long as the following two and one-half segments, fourth subequal

to fifth, both longer than the stouter, less parallel-sided sixth segment, following segments each a little shorter, tenth segment one-half longer than wide, eleventh narrower, oval in shape, about one-third longer than wide. Palpi ferrugineous. Mentum sparsely, coarsely punctate laterally and on apical half. *Pronotum* one-fifth broader than long; apex deeply, broadly emarginate, as wide as, or slightly wider than base, angles acute; sides sinuato-arcuate, arcuation most pronounced in apical half; basal angles rectangular. Base broadly, feebly emarginate. Marginal bead prominent only on base and apical angles. Disc impunctate, convex, with broad, shallow, transverse ante-basal impression, and scattered sub-obsolete impressions throughout. Propleurae vaguely rugose, rugae more pronounced on coxal convexities. *Elytra* about one-half longer than wide, sub-oval, widest at middle; base feebly arcuate, slightly wider than base of pronotum, the humeral angles prominent. Disc moderately convex, strongly at sides, abruptly declivous apically; surface sub-obsoletely striate, the second and fourth intervals more convex. Strial punctures moderate, coarser and more closely spaced than the fine, submuricate interstitial punctures, punctation becoming confused, larger and more strongly muricate laterally. Epipleurae feebly alutaceous, punctate in apical quarter. *Prosternum* obsoletely rugose, process sparsely punctate, the tip broadly, evenly rounded, concave and longitudinally carinate, the carina not attaining the apex. Mesosternum declivous anteriorly, broadly impressed at middle, sides subtuberculate, surface obsoletely rugose. Metasternum rugose, finely, sparsely punctate medially. *Abdomen* sparsely, finely punctured, fifth segment narrowly transversely sulcate near the truncate apex. *Legs* elongate, anterior pair very little stouter. Femora sparsely muricato-punctate, punctation about equal to that of abdomen. Anterior face of post-femora smooth, impunctate except at apices and immediately adjacent to tibial grooves. Tibiae more densely, coarsely muricato-punctate. Tarsi slender, plantar grooves open, setae ferrugineous. Terminal segments of all tarsi fringed with long, closely placed, ferrugineous setae.

Male.—Shorter, pronotal margins more broadly arcuate, abdomen less convex, third and fourth segments almost impunctate.

Female.—More elongate, pronotal margins less arcuate, nearly straight in basal half; abdomen convex, segments equally puncate; elytra less abruptly declivous apically.

Length, 16.5–18 mm.; width, 8–8.3 mm.

Holotype female from MOENKOPI, COCONINO COUNTY, ARIZONA, May 19, 1954, collected by Rev. R. S. Beal, Jr., deposited in the collections California Academy of Sciences, Entomology No. 6125. Allotype male (in the writer's collection) with same data but taken at Coal Mine Canyon, near Moenkopi, Arizona.

This species is most closely allied to *S. nunenmacheri* Blaisdell, from which it differs in the less elongate third antennal segment, the less coarsely and evenly punctate apical half of the mentum, the rectangular basal pronotal angles, the well formed strial punctures

of the elytra, and the shorter, broader, carinate prosternal process. The relatively elongate third antennal segment will readily distinguish this species from *S. laticeps* Horn, *S. lomae* Blaisdell, and *S. convexus* Blaisdell, in which it is shorter than the following two combined. In *S. opacus* Casey, the pronotum is relatively much more transverse, punctate, and the legs are closely, strongly punctate. The relative lengths of the basal antennal segments are not mentioned in the original description of *S. opacus Casey*, which indicates that they do not differ radically from those of *S. laticeps* Horn, with which the species is compared.

The writer wishes to thank the California Academy of Sciences for loaning a series of *Schizillus laticeps* Horn, and Mr. Hugh B. Leech, for critically comparing the holotype of *S. beali* with the unique types of Dr. Blaisdells' species.

SCHIZILLUS NUNENMACHERI Blaisdell

Mr. Leech made the following noteworthy observations on the type of *S. nunenmacheri* Blaisdell: The antennal pubescence similar to that of *S. beali*. Third antennal segment exactly equal in length to the next three combined—not four, as stated by Dr. Blaisdell. Antennal segments four, five and six are subequal, and shorter and broader than in *beali*. The apical half of mentum more coarsely and evenly punctate. The basal angles of the pronotum slightly reflexed, less than rectangular, the marginal bead not interrupted medially. The elytra more elongate and narrower, the strial punctures virtually obsolete, the interstitial tubercles well developed, the general effect thus seriate, the intervening areas quite smooth. Prosternal process sulcate between the forecoxae, narrower and longer than in *beali*, with finer and more numerous punctures. Mesosternum more abruptly declivous anteriorly and the sides more strongly tuberculate. Punctation of the hind femora as in *S. beali*.

NOTES ON NOMENCLATURE AND VARIATION IN PLATYCOTIS

(Homoptera:Membracidae)

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University of California, Berkeley

PLATYCOTIS MINAX Goding and P. MARITIMUS Van Duzee

In his catalogue (1927) and again in Fascicle 208 of Genera Insectorum (1951) Funkhouser lists *Platycotis minax* Goding as a synonym of *Platycotis maritimus* Van Duzee. Goding's *minax* was described in 1892, and Van Duzee's description of *maritimus* did not appear until 1917. *P. minax* was apparently not a homonym, and in fact in the literature of the Membracidae that trivial name appears only in reference to Goding's species. Therefore, had the two really been synonymous, *minax* should have been given precedence. However, the form which Van Duzee described as *maritimus* is distinct from *minax*. Van Duzee stated in his description of *maritimus* that it is "intermediate between *vittata* and *minax*, but more closely related to the former." Following the description he further states, "The characters given for the species seem to be constant, but wider collecting may show that it *(maritimus)* is but a phase of *vittata* inhabiting the fog belt along the coast." The author has seen the holotype of *maritimus* and agrees it is a "phase". A further discussion of the status of *maritimus* will be given later in this paper. It should be stated here, however, that the author has seen specimens of the form Van Duzee described as *maritimus* from localities far removed from the fog belt along the Pacific coast (e.g., Tennessee).

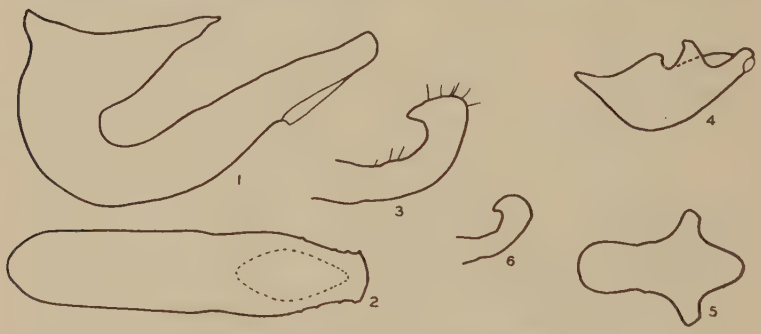
PLATYCOTIS VITTATA Fabricius and its varieties

Fabricius described *vittata* from "Carolina" in 1803. In his description he made no mention of vittae, apparently feeling that the name alone would suffice on this point. The following year (1804) Coquebert published a colored figure. The author has studied all available descriptions listed by Funkhouser in his 1927 catalogue under *Platycotis vittata* and its varieties. It is my opinion that the form Fabricius described as *vittata* is approximately the same as that described by Van Duzee as *maritimus*. The vittae referred to are in my opinion those on the cephalic portion of the pronotum, one on each side, and lying in horizontal depressions (calcitrices), immediately above the head, which are present in

all forms. It has seemingly been commonly accepted that "vittata" referred to longitudinal dark lines on the pronotum. That the species was hornless is easily seen by the fact that Fabricius placed it in a section headed "Thorace inermi." Coquebert's figure also lacks both horn and longitudinal pronotal vittae.

Unfortunately, the form generally recognized as *vittata* is the horned form described by Germar (1821) as *Platycotis sagittata.* This is by far the most abundant form of the complex, and it would of course be helpful if this had been described first.

In 1829 Thomas Say described *Platycotis quadrivittata.* This horned form is yellow with four red longitudinal stripes on the



EXPLANATION OF FIGURES

Figs. 1–3, *Platycotis vittata* Fabricius. Fig. 1, lateral view of aedeagus. Fig. 2, postero-ventral view of aedeagus. Fig. 3, apex of gonoforceps.

Figs. 4–6, *Platycotis minax* Goding. Fig. 4, lateral view of aedeagus. Fig. 5, postero-ventral view of aedeagus. Fig. 6, apex of gonoforceps.

pronotum, and is recognized today under the name, *Platycotis vittata,* var. *quadrivittata.*

Fairmaire described *Platycotis lineata* in 1846 from a form which is similar to *quadrivittata* except that it lacks the anterior pronotal horn, and is ordinarily slightly smaller.

The forms *vittata, sagittata, quadrivittata,* and *lineata,* as well as intergrades, may appear in either mixed or pure populations. For example a collection from Laytonville, California, contains 13 *quadrivittata,* 1 *vittata,* and 5 *sagittata-quadrivittata;* a smaller collection from Butte County, California, contains 5 *vittata,* and 3 *vittata-sagittata;* a third collection from Mt. Hamilton, California, contains 21 *quadrivittata.* Collections containing other combinations, as well as *sagittata* and *lineata* alone, have been seen.

Funkhouser regarded *quadrivittata* and *sagittata* as varid varieties of *vittata* in his 1927 catalogue, but apparently believed that they were invalid in his 1951 publication (the manuscript as published was completed in 1938). The fact remains that although intergrades among the forms exist in many localities, all four can frequently be recognized as distinct forms and therefore the names serve a useful purpose; that of designating a certain morphological type. The author therefore suggests that the names *sagittata*, *quadrivittata*, and *lineata* be retained as varietal designations.

Key to Varieties of Platycotis vittata

A. Without anterior pronotal horn.
  B. Pronotum brown to brownish-green, with or without longitudinal vittae . . . . . *vittata*
  BB. Pronotum yellow, with four red longitudinal vittae . . . . . var. *lineata*
AA. Anterior pronotal horn present.
  B. Pronotum brown to brownish-green, with or without longitudinal vittae . . . . . var. *sagittata*
  BB. Pronotum yellow, with four red longitudinal vittae . . . . . var. *quadrivittata*

Genitalia

The genitalia of *Platycotis vittata* and its varieties are so similar that the genitalia of only one variety are figured. The genitalia of *Platycotis minax* are so different from *P. vittata* that if the genitalia alone were used as a criterion for classification *minax* would probably be placed in a different genus. The genitalia alone have been used for specific and even generic separation in the Cerasini (Smiliinae), but because the true value of the genitalia in Membracidae is not known at present the structures are figured only to add evidence to the author's statement that *minax* is a valid species different from *vittata*. Also since the genitalia of the varieties of vittata are apparently the same, evidence is added to the opinion that *lineata*, *quadrivittata*, and *sagittata* are only varieties of *vittata*. The following numbers of mates were dissected and examined: 2 *minax*, 2 *vittata*, 2 var. *sagittata*, 6 var. *quadrivittata*, 1 var. *lineata*.

Conclusions

Four points should be emphasized in conclusion: (1) *Platycotis minax* Goding must be accepted as a valid species; (2) *P. maritimus* is a synonym of *P. vittata;* (3) *P. vittata* var. *sagittata*

is the form which has recently been recognized as *P. vittata*, and is probably to be found in most collections under the name *vittata*; (4) in the opinion of the author the names *sagittata*, *quadrivittata*, and *lineata* should be retained as varietal designations, since all are frequently found as forms distinct from *vittata* and from each other and the names are therefore useful.

Book Review

POMP AND PESTILENCE—INFECTIOUS DISEASE ITS ORIGINS AND CONQUEST. By Ronald Hare. Philosophical Library, Inc., New York. 224 pp. 1955. Price $5.75.

This little book briefly outlines the history of the more important infectious diseases of mankind. The author introduces the subject with a general discussion of the different forms of parasitism and of the principal factors involved in the communication of infectious diseases. There follows a chapter on man and his parasites and the diseases they cause. It is suggested that most of man's parasites have come from other distantly related animals rather than having evolved with man from his simian ancestors. However, in the case of the viruses, such as those causing the common cold, poliomyelitis, measles or mumps, the origin is obscure, for they posses no known relatives responsible for similar diseases in animals.

While epidemics are known to have occured among the early civilizations of the Israelites, Greeks and Romans, Dr. Hare states that it is not until the sixth century A.D. that we can name an epidemic due to a recognizable disease.

Probably the most devastating diseases of mankind are smallpox, typhus, plague, cholera, influenza and dysentery; and the history of each is reviewed concisely. An interesting chapter on past beliefs about the nature of these diseases and early methods of treatment leaves one astonished that the human race has survived at all.

Further chapters discuss the measures which can be taken by the community and by the individual to control or eradicate the diseases under discussion. Finally, the present status of the major nations in relation to these diseases is briefly analysed and the precarious nature of world population trends is pointed out.

This, then, is a popular book, clearly and concisely written, and can be recommended as interesting reading to anyone.—William C. Bentinck, *Department of Entomology and Parasitology, University of California, Berkeley.*

NEW CURCULIONIDAE FROM BRITISH COLUMBIA I

(Coleoptera: Rhyncophora)

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The following species new to science were found in material sent to the author for identification by G. Stace Smith of Creston, British Columbia, and H. B. Leech of the California Academy of Sciences. The material used in this study is in the following collections: Canadian National Collection (C.N.C.); E. L. Sleeper Collection (E.L.S.); G. Stace Smith Collection (G.S.S.); and the Entomological Collection, California Academy of Sciences (C.A.S.). The author is indebted to both for the type material.

Sitona lupina Sleeper, new species

Male.—Elongate, robust, parallel; black throughout; elytra densely covered with very small, ovate, gray, white and black scales which obscure punctures of intervals and nearly those of striae; intervals moderately clothed with long, brown, appressed setae, alternate intervals with distant, erect white setae; prothorax sparsely covered with larger, oval white and brown scales, densely clothed with suberect setae; head and rostrum sparsely covered with narrow, elongate, white and cupreous appressed scales, appressed white setae and long, erect, bristling brownish setae which are visible only in profile.

Rostrum slightly longer than wide; carinate medially in apical third, carinate laterally throughout length; deeply, narrowly sulcate from apical third to vertex of head; densely coarsely punctured, intervals between finely punctulate. Antennal scape nearly as long as funicle, less than one half longer than club. First segment slightly longer than following two, second longer than third. Head coarsely, deeply punctured with intermixed finer punctures. Eyes feebly convex, inner margin distinctly elevated above front.

Prothorax wider than long, sides strongly arcuate, strongly constricted at apex; pronotum with large, dense, coarse punctures. Scutellum densely clothed with robust, elongate, flattened pearl white scales. *Elytra* elongate, sides parallel in basal half then evenly rounded to apex; striae deeply impressed, strial punctures small, rounded, deep, about twice their diameter apart, each puncture with an appressed, white, bristle-like setae; intervals feebly convex, densely covered with scales, third interval tesselated throughout length; odd intervals with distantly placed, long, semierect, white, bristle-like setae. *Ventral side* densely clothed with rounded white scales, and long reclining, fine, white setae; apex of fifth abdominal segment with a small patch of brown scales and setae. Abdominal segments finely, densely punctured; posterior margin of first emarginate at middle, first and second

segments broadly concave at middle, fifth segment flattened, truncate at apex. Pygidium visible. Length 6.3, width 2.5 mm.

Female.—First segment of antennae only as long as following two combined, second longer than third. First abdominal segment strongly convex, posterior margin broadly sinuate, posterior half very feebly depressed, second not impressed, fifth segment sloping upward, with a rounded, denuded spot at apex, apex broadly rounded, not truncate. Pygidium not visible. Length 6.2 mm., width 2.4 mm. (All measurements of length are from the base of the rostrum to the apices of the elytra.)

Holotype male, and allotype female, CRESTON, BRITISH COLUMBIA V-17-1945 (G. Stace Smith, E.L.S.). Nineteen paratypes: 5, V-16-1945; 1, V-17-1945 (E.L.S.); 4, V-16-1945; 3, V-18-1945; 3, V-19-1945; 2, V-17-1945; 1, IV-21-1930 (G.S.S.). All type material from Creston, British Columbia, collected by G. Stace Smith on *Lupinus sericeus* Pursh. Length of paratypes 4.6–6.5 mm., width 1.7–2.5 mm.

S. lupina is near *S. prominens* Casey but is more robust; it differs in antennal characters and has the rostrum longer and more slender. In the type series the males are uniformly larger than the females.

Listronotus leechi Sleeper, new species

Male.—Oblong, robust; black, antennae and tarsi dark reddish brown; densely clothed with round, flat, appressed, brown, black, and white scales; each elytral interval with a row of erect, distantly placed, nearly clavate setae.

Rostrum as long as pronotum, robust, nearly straight, with a prominent carina at middle in apical fourth, carina subobsolete toward base, coarsely, closely, deeply punctured; densely clothed with rounded scales, laterally with erect, bristle-like setae. Antennae inserted in apical fourth; second segment of funicle only one-third longer than first. Head convex, closely, coarsely deeply punctured; densely covered with round flat scales except along apical margin of prothorax where scales are narrowed, appressed and seta-like; front with a small, deep, rounded puncture. *Prothorax* slightly wider than long; sides evenly rounded, evenly arcuate at base; pronotum densely, coarsely, deeply punctured with scattered larger punctures each with a long, erect, bristle-like setae; clothed with intermixed black and brown scales, lighter scales more frequent laterally. Scutellum densely clothed with narrow, white, appressed scales. *Elytra* oblong, one-fourth wider at base than prothorax, sides parallel in basal two-thirds then rounded to apex; tips of elytra conjointly rounded; striae fine, feebly impressed, punctures minute, rounded; intervals flat, densely covered with intermixed black, brown, and white scales, each interval with a row of distantly placed setae, more prominent at declivity. *Ventral side* densely clothed with round scales, long, erect, fine setae and short, fine, appressed setae. First visible abdominal segment broadly, deeply impressed, second slightly depressed at middle,

fifth segment feebly convex; all segments coarsely, closely, deeply punctured throughout. Length 5.7 mm., width 2.3 mm.

Female.—First abdominal segment strongly convex, feebly impressed along posterior margin at middle; fifth ventral strongly impressed longitudinally at middle, a blunt tubercle each side of impression, bottom of impression smooth shining. Length 6.6 mm., width 2.6 mm.

Holotype male, and allotype female, RAWLINGS LAKE, LUMBY, BRITISH COLUMBIA X-3-46 (H. B. Leech, C.N.C.). Ninety-one paratypes deposited as follows: 18 (E.L.S.); 37 H. B. Leech (C.A.S.); 18 (G.S.S.); and 18 (C.N.C.). All material was collected by H. B. Leech at the type locality the same date. Length of paratypes 4.3–6.7 mm., width 1.6–2.8 mm. All examples were found beneath stones.

L. leechi is nearest *L. debilis* Blatchley, but *leechi* has the fifth abdominal segment of the male evenly punctured throughout without a median apical smooth area of *debilis;* fifth abdominal segment of *debilis* scarcely modified, having only a median apical area which is less densely and more finely punctuate. this region but very slightly depressed.

Dorytomus columbianus Sleeper, new species

Male.—Oblong, convex, subparallel; black; head, rostrum, median line of pronotum, and antennae dark reddish brown; prothorax, a fascia on elytra, outer edge of abdominal segments, legs, and tarsi reddish brown; densely clothed with fine white and black appressed setae.

Rostrum as long as pronotum, straight, moderately robust, finely, densely punctured, feebly carinulate. Antennae inserted in apical third. First segment of funicle shorter than following two. Club darker. Head convex, coarsely, deeply punctate, intervals between punctures alutaceous; front punctured, without fovae. *Prothorax* wider than long, quadrate, sides subparallel, suddenly rounded to apical constriction; pronotum closely, coarsely punctate; vestiture sparse on pronotum, condensed in a line each side of prothorax. *Elytra* elongate, sides parallel in basal half, then evenly rounded to apex; striae feebly impressed, punctures round, deep, close-set, about half their diameter apart; intervals broad, feebly convex, confusedly, minutely punctulate. *Ventral side* densely clothed with long, pale, prostrate setae; abdominal segments densely punctured. Prosternum shallowly emarginate in front of coxae. Femora robust, darkened distally. Anterior femora armed with a large, broad tooth. Tibiae long, slender. Claws large, divergent, simple. Length 4.2 mm., width 1.8 mm.

Female.—Oblong, convex, subparallel; reddish brown, rostrum, head, median line of pronotum, antennae, and basal fourth of elytra dark reddish brown, metasternum, lateral side pieces of meso- and metasternum black, a large black spot at apical declivity of elytra interrupted by dark reddish

brown sutural line; densely clothed with fine white and black appressed setae. *Rostrum* one-fourth longer than pronotum, slender, straight, densely, finely punctured, feebly carinulate. Antennae inserted just beyond middle; first segment of funicle as long as preceding two. Club darker. Head convex, coarsely, deeply punctate, intervals between punctures smooth, shining; vertex with a small deep, elongate puncture. *Prothorax* as in male. *Elytra* as in male, except as follows: striae less strongly impressed; intervals more flattened; black spot at declivity interrupted so as to appear as two individual spots; vestiture condensed in uneven maculae. *Ventral side* as in male; except coloration of abdominal segments which are reddish brown throughout. Anterior femora with a small tooth. Length 4.7 mm., width 2.1 mm.

Holotype, male, CRESTON, BRITISH COLUMBIA, IV-13-52, (G. Stace Smith, E.L.S.). Allotype, female, Creston, British Columbia, IV-11-52 (G. Stace Smith, E.L.S.). Two hundred and twenty-three paratypes deposited as follows: 2, IV-7-52; 8, IV-9-52; 10, IV-11-52; 53, IV-13-52; 3, IV-15-52; 2, IV-23-52; 2, IV-27-52; (E.L.S.). 20, IV-13-52; (C.N.C.). 8, IV-9-52; 16, IV-11-52; 98, IV-13-52; 1, IV-23-52; (G.S.S.). All material was collected at Creston, British Columbia by G. Stace Smith. Length of paratypes 4.0–4.7 mm., width 1.8–2.1 mm. Beaten from the top of a giant popular (*Populus trichocarpa* T. & G.) by G. Stace Smith.

The male of this species is unlike any other species of the genus. The female resembles superficially *D. nubeculinus* Casey but differs by the longer, feebly carinulate rostrum, shorter first segment of the funicle, darkened club, and small, deep, elongate puncture on vertex.

Magdalis lecontei decepta Sleeper, new species

Male.—Cuneiform, robust, strongly convex, dark blue; rostrum, antennae, and tarsi black.

Rostrum strongly curved, cylindrical, one third longer than pronotum, finely densely punctured, densely rugosely punctured laterally between eye and point of insertion of antennae. Antennae inserted at basal two-fifths of rostrum. First segment of funicle longer than second, second shorter than following two segments. Head densely, closely punctured, intervals between punctures alutaceous. *Prothorax* strongly convex, wider than long, sides converging from base to apex, apex three-fifths as wide as base; pronotum coarsely, closely punctured, intervals between punctures alutaceous. *Elytra* elongate, sides feebly divergent in basal three-fourths, then rounded to apex; striae not impressed, strial punctures elongate, rectangular, deep, very narrowly separated; intervals broad, flat, punctures confusedly placed on intervals. *Ventral side* closely, coarsely punctured; abdominal segments 2-5 finely densely punctured, clothed with short, fine, pale, appressed pubescence. First abdominal segment narrowly deeply impressed. Lateral side pieces denuded. Length 6.2 mm., width 2.6 mm.

Female.—Rostrum one-half longer than pronotum, feebly curved. Poster-

ior half of first abdominal segment and anterior half of second segment broadly, shallowly impressed. Length 6.3 mm., width 3.0 mm.

Holotype male, and allotype female, KELOWNA, BRITISH COLUMBIA, V-14-1932 (G. Stace Smith, E.L.S.). Two paratypes, male and female, same data (G.S.S.). Length of paratypes 6.0–6.3 mm., width 2.7–3.0 mm. I am also placing two examples, one from Sanca, British Columbia, VI-9-1933 (G. Stace Smith), and Kootenay Landing, British Columbia, Shaw Creek, VI-18-50 (G. Stace Smith, G.S.S.).

This subspecies closely resembles *M. lecontei lecontei* Horn but differs as follows: strial punctures elongate, rectangular, deep, very narrowly separated; second segment of antennae shorter than first, shorter than following two segments.

M. lecontei decepta represents a northern subspecies of this group. *M. lecontei lecontei* occurs in Oregon, California, Arizona, Colorado, Wyoming, and southern Washington; *M. lecontei superba* Fall is known from Arizona, *M. lecontei tenebrosa* Fall is known from New Mexico, Colorado, and California, *M. lecontei tinctipennis* Fall is known from Cloudcroft, New Mexico and Williams, Arizona.

Anthonomus deceptus Sleeper, new species

Male.—Elongate, oval, red, feebly shining, head, meso- and metasternum dark reddish black; very sparsely clothed with short, fine, prostrate white pubescence.

Rostrum one-half longer than pronotum, feebly curved, coarsely, densely punctate throughout, more densely just before eyes, a prominent dorsal median carina from base to apical third. Scrobes of antennae directed against eyes. Antennal scape not reaching eyes; funicle six-segmented, first segment as long as second and third combined, second as long as third and fourth, sixth segment subcontiguous with club. Club narrow, elongate, loose, preceptibly darker at tip. Head coarsely, moderately punctate; front rugosely punctate. *Prothorax* wider than long, sides arcuate in basal two-thirds, then moderately constricted to apex; pronotum coarsely, closely, deeply punctate, pubescence directed anteriorly, more coarse just before scutellum. *Elytra* one-third wider at base than prothorax, sides sub-parallel to apical third, then rounded to apex; striae impressed, strial punctures coarse, round, deep, separated about one-half their diameter; intervals very feebly convex. *Ventral side* clothed as dorsum, vestiture a little coarser on meso- and metasternum. Abdominal segments very minutely, sparsely punctate, third and fourth segments equal, fifth nearly as long as fourth. Front and middle femora with a very small tooth, posterior femora each with a very minute denticle. Front and middle tibiae mucronate, posterior tibiae unarmed at tip. Tarsal claws armed with a large, distinct tooth. Length 2.7 mm., width 1.3 mm.

Holotype male, COPPER MOUNTAIN, BRITISH COLUMBIA, VI-8-30 (G. Stace Smith, E.L.S.).

In general appearance this could be quite easily confused with a member of the genus *Pseudanthonomus*. However, it must be placed in *Anthonomus* because the scrobes are directed against the eyes while in *Pseudanthonomus* they are always distinctly directed beneath the eye. This species is not closely related to any other member of the genus *Anthonomus*. It is peculiar in the relationship of the last segment of the funicle to the club and in structure of the club.

Anthonomus quesnelensis Sleeper, new species

Male.—Elongate, very convex; black; antennae, legs, and tarsi pale reddish brown; densely clothed with oval appressed scales which are predominately brown; scutellum, short scutellar line, interrupted line on fourth interval commencing about middle, another on sixth interval from base to middle, of white scales.

Rostrum one-third longer than pronotum, strongly-curved, slender, cylindrical, deeply, densely punctured throughout, faint evidence of a median carina in basal half, base sparsely clothed with white scales. Antennae inserted in apical third, funicle six-segmented, first segment longer than second and third combined, second longer than third, third and fourth equal. Club darker almost black. Head convex, densely clothed with white scales, front with elongate, deep fovae. *Prothorax* wider than long, sides convergent from base, slightly rounded; apex very feebly constricted; pronotum coarsely, densely punctured, with a narrow median line and a stripe each side of white scales. *Elytra* oval, scarcely wider at base than prothorax, sides evenly rounded, widest at middle; striae deep, punctures large, close-set, about half their diameters apart, obscured by scales; intervals broad, strongly convex, finely punctulate. *Ventral side* densely clothed with oval, appressed, white scales. Abdominal segments finely, sparsely, deeply punctured, fifth segment with a few narrow hair-like scales at apex; pygidium prominently visible from ventral view. Legs slender, densely clothed with white scales. Anterior femora armed with a very minute acute tooth, remaining femora unarmed. Claws darkened, each armed with a long slender tooth. Length 2.2 mm., width 0.9 mm.

Female.—Very similar to male, with the rostrum nearly twice as long as pronotum; fifth abdominal segment longer, more coarsely punctured, evenly rounded to apex; pygidium not visible from ventral view. Length 2.3 mm., width 1.0 mm.

Holotype male, QUESNEL, BRITISH COLUMBIA, VI-16-1949, G. J. Spencer, allotype female, same locality, VII-11-1949 (E.L.S.). Six paratypes all males are as follows: 1, same data as holotype (E.L.S.); 2, same data as holotype; and 1, same locality as holo-

type, VII-2-1949 (G.S.S.); 2, same data as holotype in collection of G. J. Spencer, University of British Columbia.

This species is nearest to *A. lineatulus* Dietz, to which it keys in Dietz (1891). It differs from *lineatulus* as follows: rostrum not depressed near apex, without a definite median line and striae each side, dull, densely punctured; sides of elytra not parallel, subhumeral tubercle lacking, punctures of striae close, not completely concealed by scales.

Baris stacesmithi Sleeper, new species

Male.—Oblong-oval, convex; black; feebly shining, without a brassy luster; elytra with distant, narrow, very short, pale, recurved scales in punctures of intervals.

Rostrum two-thirds as long as pronotum, robust, strongly curved, impression between rostrum and head strong; sparsely, finely, deeply punctured, coarser laterally. Antennae inserted near middle of rostrum; first segment of funicle as long as following three. Club small, compact, ovate. Head strongly convex, sparsely, finely punctured, strongly alutaceous. *Prothorax* one-fourth wider than long, sides feebly convergent, sides nearly straight in basal two-thirds, then rounded to a feeble apical constriction, apex truncate, base with a feeble, truncated lobe; pronotum densely, coarsely, deeply punctured, intervals between punctures strongly alutaceous. Scutellum small, rounded. *Elytra* elongate, parallel in basal two-thirds, then rounded to apex; striae deeply impressed, strial punctures minute, nearly obsolete, about twice their diameter apart; intervals broad, flat, alutaceous; punctures large, close-set, round, deep, in a single line, their diameter one-third width of intervals, each with a short, narrow, pale, recurved scale. *Ventral side* coarsely, densely punctured, each puncture except those of prosternum with a short, narrow, pale, recurved scale. Abdominal segments strongly convex, first segment broadly impressed, punctures distant, nearly obsolete in impression, second segment feebly impressed anteriorly, suture between first and second segment obsolete at middle, third and fourth segments punctured only along posterior margin at middle, fifth segment truncate at apex with a short median lobe, a deep notch each side of lobe. Legs short. Femora distinctly but sparsely punctured, each puncture with a narrow, short, recurved seta. Pygidium and preceding tergite visible from above. Length 4.0 mm., width 1.8 mm.

Female.—Rostrum nearly as long as pronotum. First abdominal segment just perceptibly flattened, punctures distant, very minute in flattened area; second not perceptibly flattened, suture between first and second segments visible, strongly emarginate at middle; fifth segment truncate at apex, not modified at middle as in male. Length 4.0 mm., width 1.8 mm.

Holotype male, and allotype female, CRESTON, BRITISH COLUMBIA, VI-30-45 (G. Stace Smith, E.L.S.). Thirty-one paratypes as follows: 5, VI-30-45; 1, VII-2-1945; 1, VII-6-1945; 3, VII-1-1951 (E.L.S.); 2, VI-17-1945; 10, VI-30-1945; 2, VII-6-1945;

7, VII-1-1951 (G.S.S.). All type material was collected at Creston, British Columbia, by G. Stace Smith on *Artemisa gnaphalodes* Nutta.

A few examples have evidence of a smooth median line and a few have some of the punctures confusedly placed on elytral intervals. Length of paratypes 3.5–4.5 mm., width 1.6–2.0 mm.

This species keys to *B. futilis* Casey in his treatment of the genus in 1892. It differs from *futilis* in the absence of the brassy luster, the widely separated punctures of pronotum, the peculiar modification of the fifth abdominal segment of male, and the longer rostrum.

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THE SOUTHWESTERN RESEARCH STATION OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

The American Museum of Natural History has announced the establishment of The Southwestern Research Station. It is located on the eastern slope of the Chiricahua Mountains, near Portal, Cochise County, in southeastern Arizona. The property is within the limits of the Coronado National Forest at an elevation of 5400 feet.

The station was established for the purpose of making available research facilities for scientists and students in all branches of sciences, who have problems that can be investigated through the utilization of the faunal, floral and geological features of the area. It will be open during the entire year.

It is operated by the American Museum of Natural History, Central Park West at 79th Street, New York 24, New York and under the direction of Dr. Mont A. Cazier, Chairman and Curator of the Department of Insects and Spiders, to whom all inquiries should be addressed. Anyone interested in the station should write Dr. Cazier for the booklet which gives the details of the operation and a general description of the area.—*Editor.*